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grinding and finishing

may 1957

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Internal Grinder Cuts Cycle Time Up To 50% —page 32

Grinding Techniques at Germany's Volkswagen

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Heald's new Rite-Angle internal grinder —page 32

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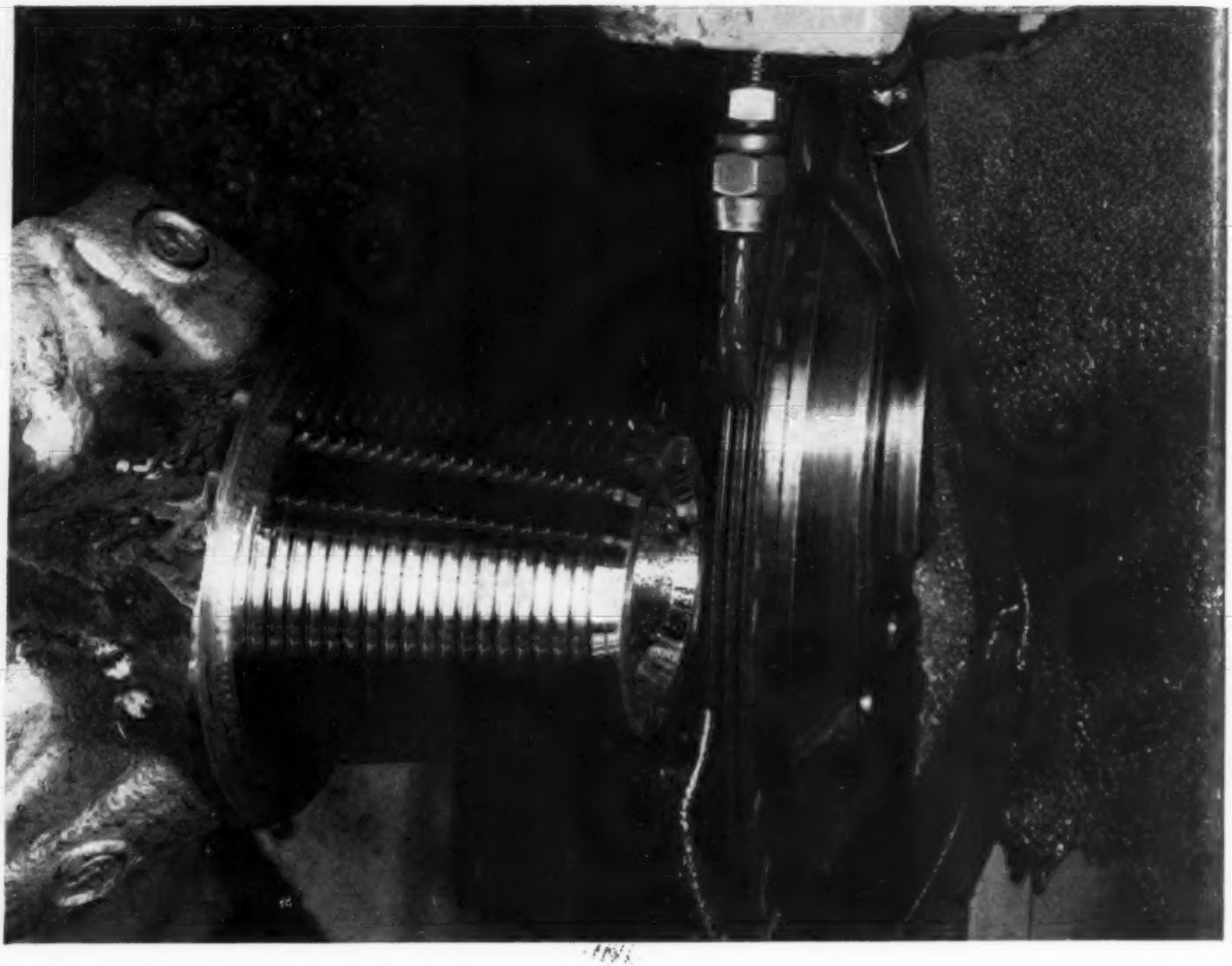

Accurate threads, fine finish, clean wheels with Texaco

This 24" multi-rib diamond dress wheel is used to thread rock bits of tough AISI 4620 alloy steel on a Jones & Lamson Thread Grinder. It's a one-pass operation at 1910 rpm—grinding 5 threads per inch—4½ API. And they *have* to be accurate.

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Grinding and Finishing

the magazine of abrasive metalworking operations

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BPA

FEATURE ARTICLES

New Development Permits Continuous Form Dressing 24
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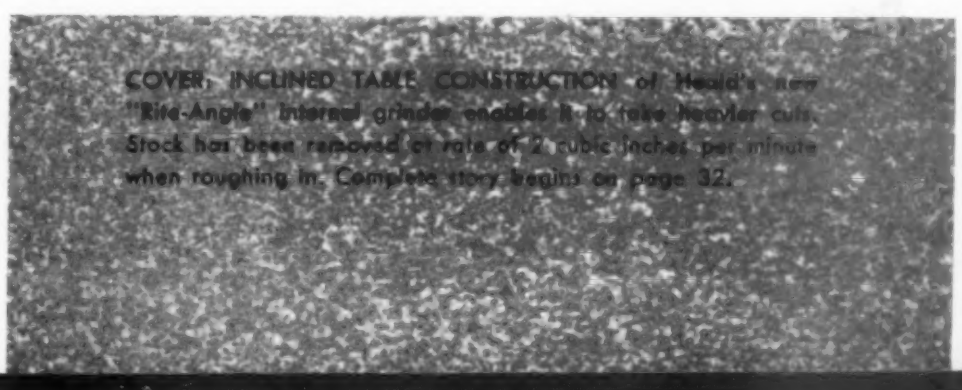

COVER, INCLINED TABLE CONSTRUCTION of Heald's new "Rite-Angle" internal grinder enables it to take heavier cuts. Stock has been removed at rate of 2 cubic inches per minute when roughing in. Complete story begins on page 32.

Here's the Point . .

. . . your standard and special tooling high precision work, from the point on a textile machine part to small armature shafts, get the most economical grind on CINCINNATI® FILMATIC 4" Plain Hydraulic Grinders. May we tell you more? Catalog No. G-551-4 contains complete data; write for a copy.

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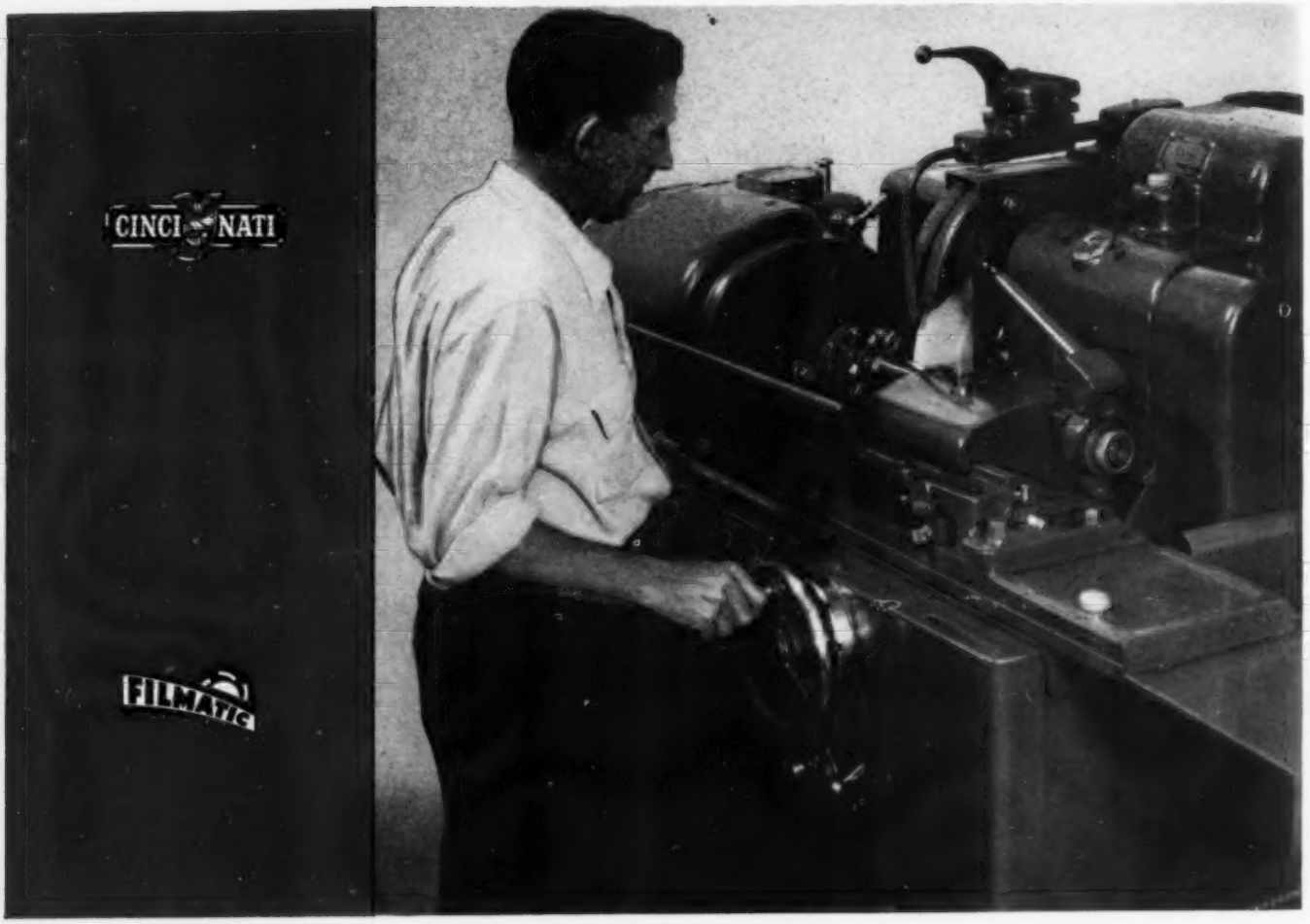

CINCINNATI FILMATIC 4" PLAIN HYDRAULIC GRINDING MACHINE
Catalog No. G-551-4
Brief Specs. in Sweets

Master roller gages are ground to accuracies of 10 millionths in roundness and size on the CINCINNATI FILMATIC 4" Plain illustrated here. Surface finish within 2 micro-inches. Of course this machine is equipped with a number of extra features to enable it to produce ultra-precision work of this type. Compared to the previous machine and method, tolerances have been cut in half and production is about seven times greater.

CINCINNATI

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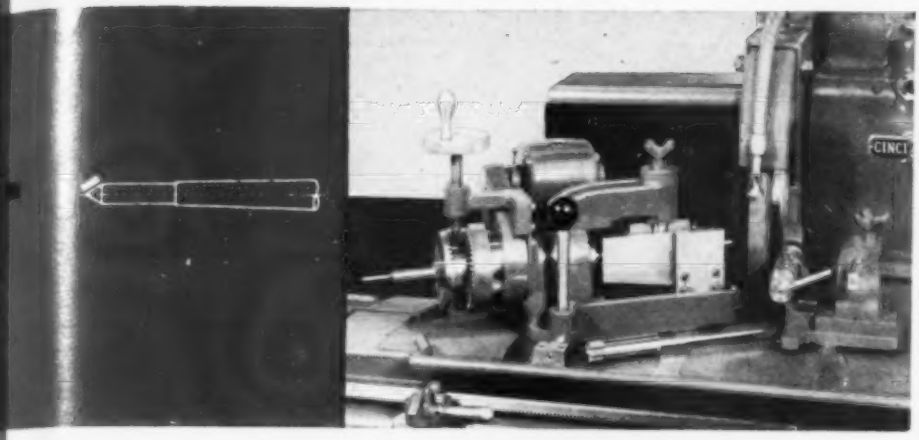
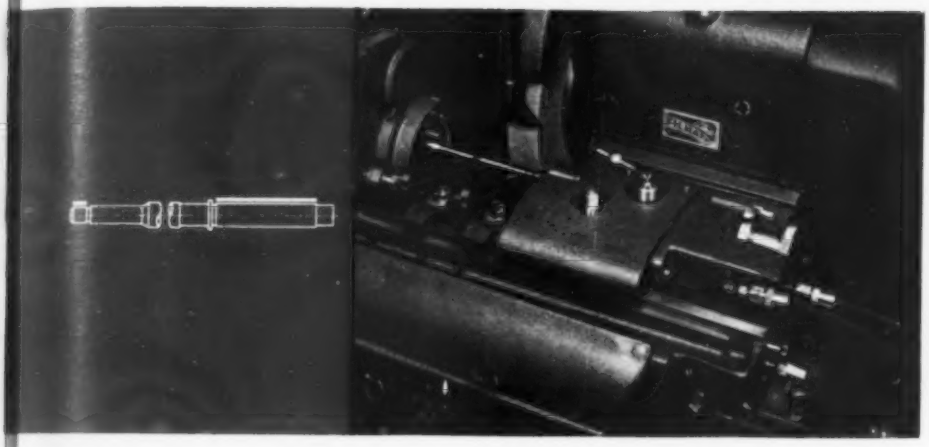
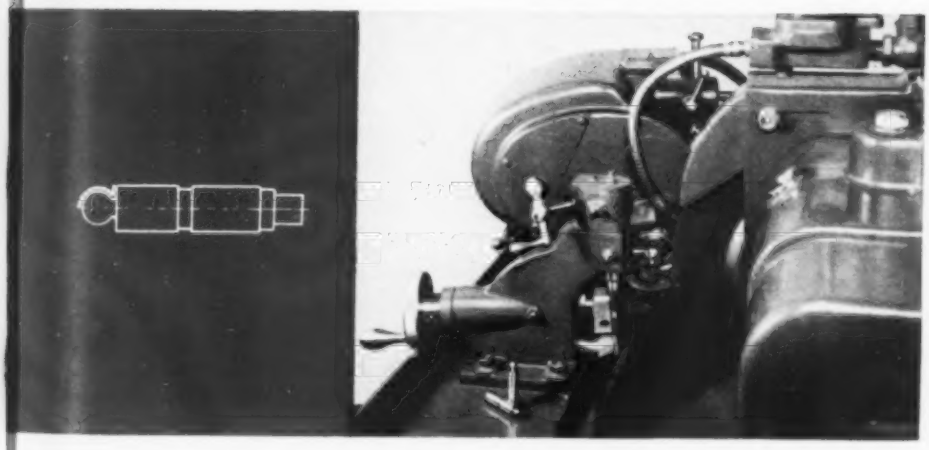


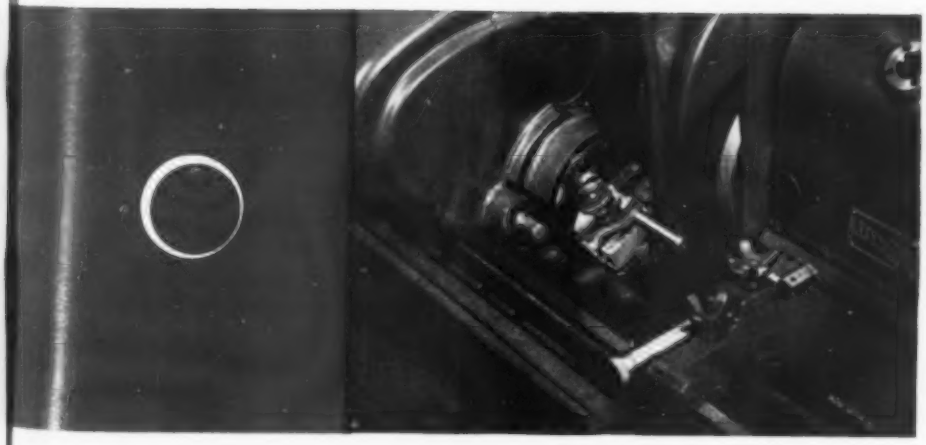
Center angle and point radius are ground concentric with bearing diameters on textile machine parts. This Cincinnati engineered equipment illustrates how simply an unusual production job can be tooled up on a CINCINNATI FILMATIC 4" Plain Hydraulic Grinder. Conventional swivel table, headstock and footstock have been omitted and replaced by a special fixture.



Two diameters are precision ground on armature shafts in two setups, at the rate of 200 per hour per diameter. To reduce operator fatigue while maintaining a high rate of production, the CINCINNATI FILMATIC 4" Plain Hydraulic Grinder for this job is equipped with automatic infeed, hydraulic footstock and work cradles.



Ball end and shoulder are ground in one chucking on a CINCINNATI FILMATIC 4" Plain Hydraulic Grinder. Unique tooling for this job includes combination radius and angular truing attachment, and table with an angular bearing section for live spindle headstock featuring a lever operated draw-in collet attachment.



.048" eccentric diameter ground from the solid. The CINCINNATI FILMATIC 4" Plain Hydraulic Grinder at the left easily handles this heavy stock removal job. Equipment is practically standard with the exception of the work holding fixture and a special table type truing attachment.

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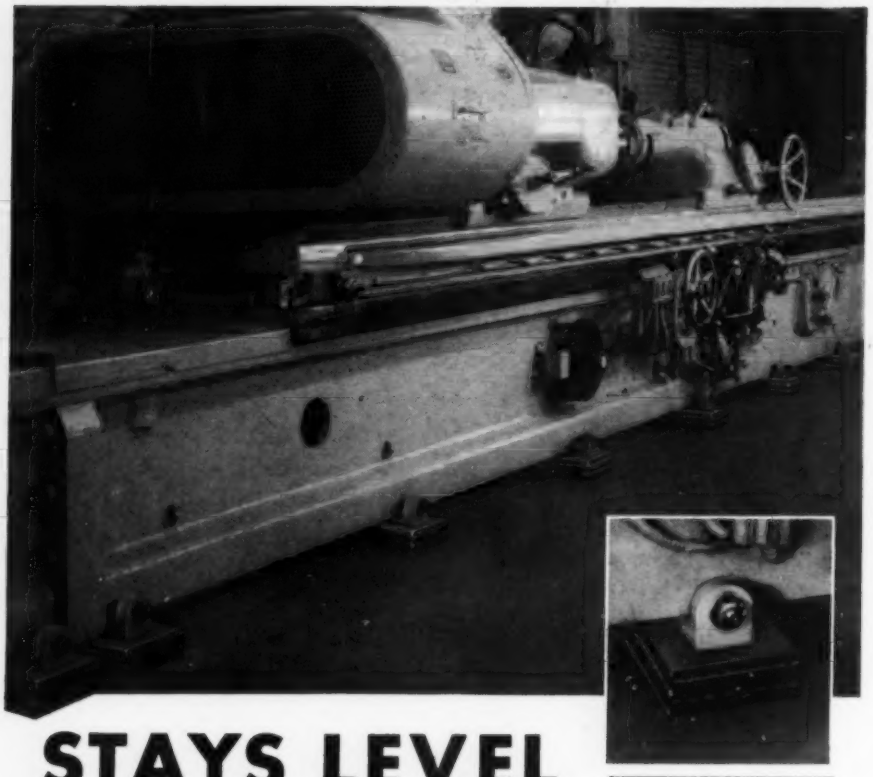

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Insert shows use of Air-Loc and leveling plates. No bolts or cement needed.

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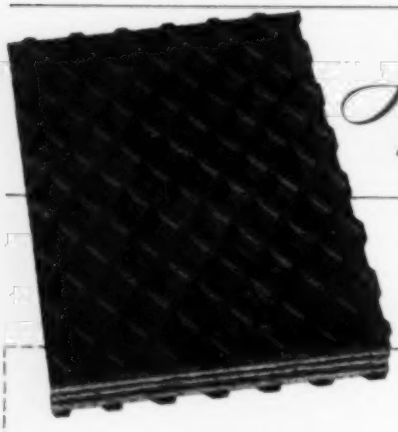

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You get a permanent precision installation with patented AIR-LOC mounts that *Resist* oil, water and alkali, *Permit* easy leveling, *Eliminate* need for bolts or cement, *Hold* machines in place, *Reduce* transmitted vibration from the floor.

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Letters to the Editor

Pruning the Cost Hedge

Your editorial in the March issue of Grinding and Finishing was excellent, timely, and much in need. Sensible and well directed cost reduction is a subject that is particularly close to our total and collective hearts in 1957. In fact we are creating a special series of seven or eight direct mail pieces for distribution to general industry this year. They deal specifically with cost reduction.

Our particular interest is value analysis in the procurement of carbides and carbide cutting tools. Now, much admittedly has been said about value analysis in procurement, but it never seems to get beyond the conversation piece. We have yet to see a good, complete and integrated cost reduction or value analysis program as it relates to carbides and tooling that has any real teeth.

Your editorial hit very close to my personal heart, since I just installed a privet hedge in front of my new house. And while I have not yet pruned it, I'm going to take your advice and certainly not skin it like a cat. Your idea of pruning as it pertains to cost reduction programs comes pretty close to what we are trying to convey. It seems that every now and then companies go hog wild for cost savings programs on pencils, paper clips, and rubber bands. Yet when it gets to real sources of cost—namely—carbides, misapplication of carbides, and carbide cutting tools, no one seems to know what to do. They seem to approach, in a good many cases, these cost problems by becoming frustrated with the consequences rather than the real causes of tool cost problems. A great many efforts can be compared to the housewife who discovers her bathtub running over

(Continued page 6)

(PATENT APPLIED FOR)

NEW MANHATTAN SAFETY BACK FLARED CUP

Not simply a new safety "feature" . . . not merely a design "improvement." Here's a *totally new concept* of flared cup wheel design *and* construction . . . developed by Manhattan engineers to give the greatest safety and performance advantages possible for flared cup wheel users. Manhattan's revolutionary SAFETY BACK Flared Cup puts portable wheel *safety* where it counts the most—in *original* strength and breakage resistance!

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- **One Piece Assembly**
- **Highest Safety Factor**
- **Improved Mounting Base**
- **Requires No Adjustment**

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Let a Manhattan abrasive wheel engineer show you the advantages of SAFETY BACK Flared Cups, and other types of Manhattan high speed, heavy duty abrasive wheels. Write for Bulletin 7157.

RM-752

GRINDING WHEEL INSTITUTE MEMBER

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MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

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HOW USERS OF THE *Lusol* LINE TEST COOLANT DILUTIONS RIGHT AT THE MACHINE IN 60 SECONDS

If your coolant dilution is too lean, you run the risk of rust; if it is too rich, you get stickiness and, what is more, you are wasting coolant and throwing money down the drain. Without checking, it is easy to throw your balance off as much as 50%. A regular laboratory analysis takes a good deal of time, but with this "concentration kit", users of the Lusol Line of coolants get the answers in 60 seconds. That's why users of Lusol products have no trouble in maintaining correct dilutions, and one good reason why they always get better results, greater machining accuracy, longer tool life, longer production runs. Investigate this unique and important control feature. A demonstration is yours for the asking.

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- Let us demonstrate in your plant.

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and tries to mop up the water on the floor without turning off the running faucet.

I wish more people would read editorials for I feel that your March Grinding and Finishing editorial is a particularly good one.

G. A. MANCHESTER, Director
Public Relations &
Advertising
Wesson Company

Classifying Tool Steels

As representatives in Chile of one of the leading export affiliations of American machine tool manufacturers we find your magazine not only interesting but also extremely helpful. We certainly read it carefully.

We would like to receive 2 (or 3 if available) reprints of "Classifying Tool Steels by Grinding Characteristics."

Thank you in advance.

ERIC KATZENSTEIN
Empresa Techica Ltd.
Santiago, Chile

Billet Grinding

We would appreciate receiving 20 copies of pages 46 and 47—"Semi-Automatic Billet Grinding" from the December 1956 issue of "Grinding and Finishing."

If there is any charge for these, please advise, and we will send a remittance to cover it.

W. F. PARSONS
Technical Correspondent
Bonded Abrasives Division
The Carborundum Co.

Reprint Requests

Would you kindly forward me a copy of the following articles which appeared in the December issue:

P.21 Recent Russian advances in production of abrasives.
P.24 Weld grinding applied to washing machines.
P.33 Developing standard time data for grinding operations.

Also the recent articles called "Significance and measurement of surface finish."

W. J. Voss
Birmingham, England

Grinding Steel Balls

We are very interested in ob-

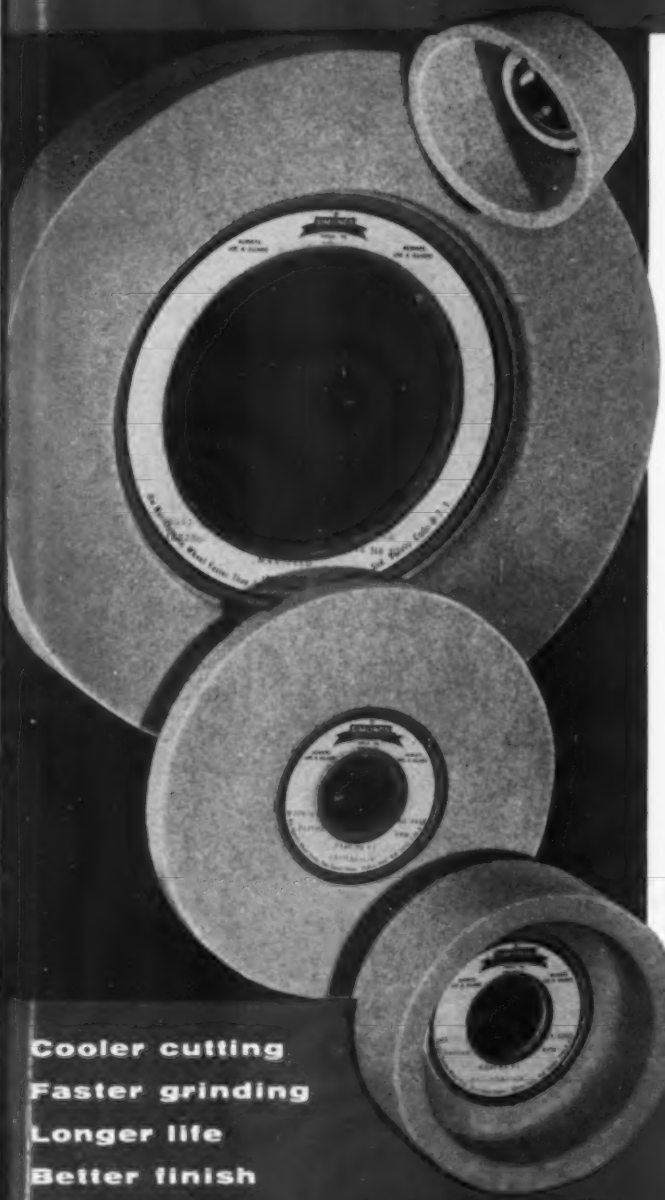
(Continued page 8)

New and Radically Different

SIMONDS SA *Borolon*®

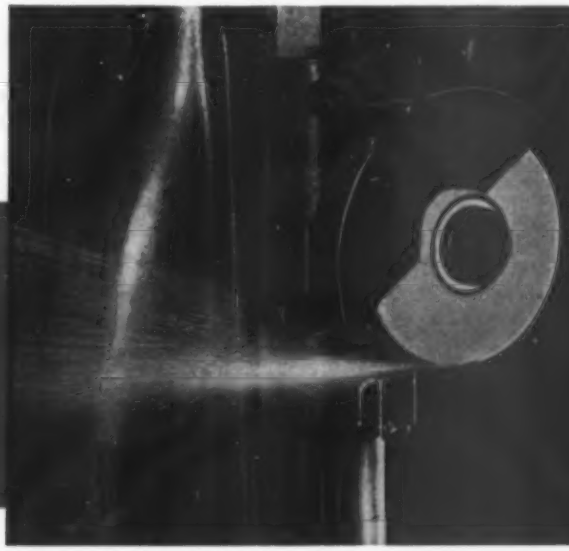
TRADE MARK

Grinding Wheels for Toolroom use



SA Borolon is a single crystal aluminum oxide abrasive possessing superior qualities over conventional white aluminum oxide abrasive. It is produced from a furnace charge consisting of a molten base with a soluble matrix which dissolves, leaving single, natural crystals of abrasive grain *without crushing.*

SA Borolon is tougher because it is free of the inner strains to which crushed abrasive is subjected. It penetrates deeper and cuts faster because each abrasive particle has more sharp, free-cutting edges. It cuts cooler because its resistance to dulling lessens frictional drag. Use these new wheels on your tool grinding jobs — and see the surprising difference in their grinding action. Write for illustrated Catalog Bulletin ESA-272.



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Faster grinding
Longer life
Better finish

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taining additional copies of the excellent article "How Precision Steel Balls are Ground and Finished" on page 27 of the December Issue of your publication. We could make good use of 50 to 100 copies of this article, if that many copies are available.

K. JOSEPHSON
Advertising Manager
Marlin-Rockwell Corp.

Surface Finish

Would you kindly send me 2 copies of your (Series of articles on "Significance and Measurement of Surface Finish" by R. E. Reason).

They are to be placed in our files where they will be available for reference purposes by Design Personnel of our Engineering Department.

JERRY BAUDER
Design Producibility Group
Engineering Department
North American Aviation, Inc.

Industry Observer

As we promised you last month in this column, a number of real advances in abrasive processing have just come to light. About three weeks ago, Bill Schleicher, G & F's editorial director, visited Jones & Lamson and found them willing to talk freely about their spectacular new form grinding development. Hence our exclusive interview coverage of cemented diamond particle dressing cutters beginning on page 24.

Word also reached us that Buick had had the basic diamond cutter principle in operation running beautifully on a production job for some time. Our managing editor, Jack Kenyon, was dispatched to Flint to round up that story, which appears on page 29.

Heald's new slanted-bed internal

(Continued page 16)

A wheel for every job . . .

For every surface grinding job . . . whether tough as copper or fragile as glass . . . there's a Blanchard wheel that's *best.*

Blanchard grinding wheels, for use on Blanchard Surface Grinders, are made in cylinder, segment and sectored types. By selecting from a variety of vitrified, resinoid and silicate bonds and a number of different abrasives, Blanchard is able to make exactly the right wheel for every surface grinding job.

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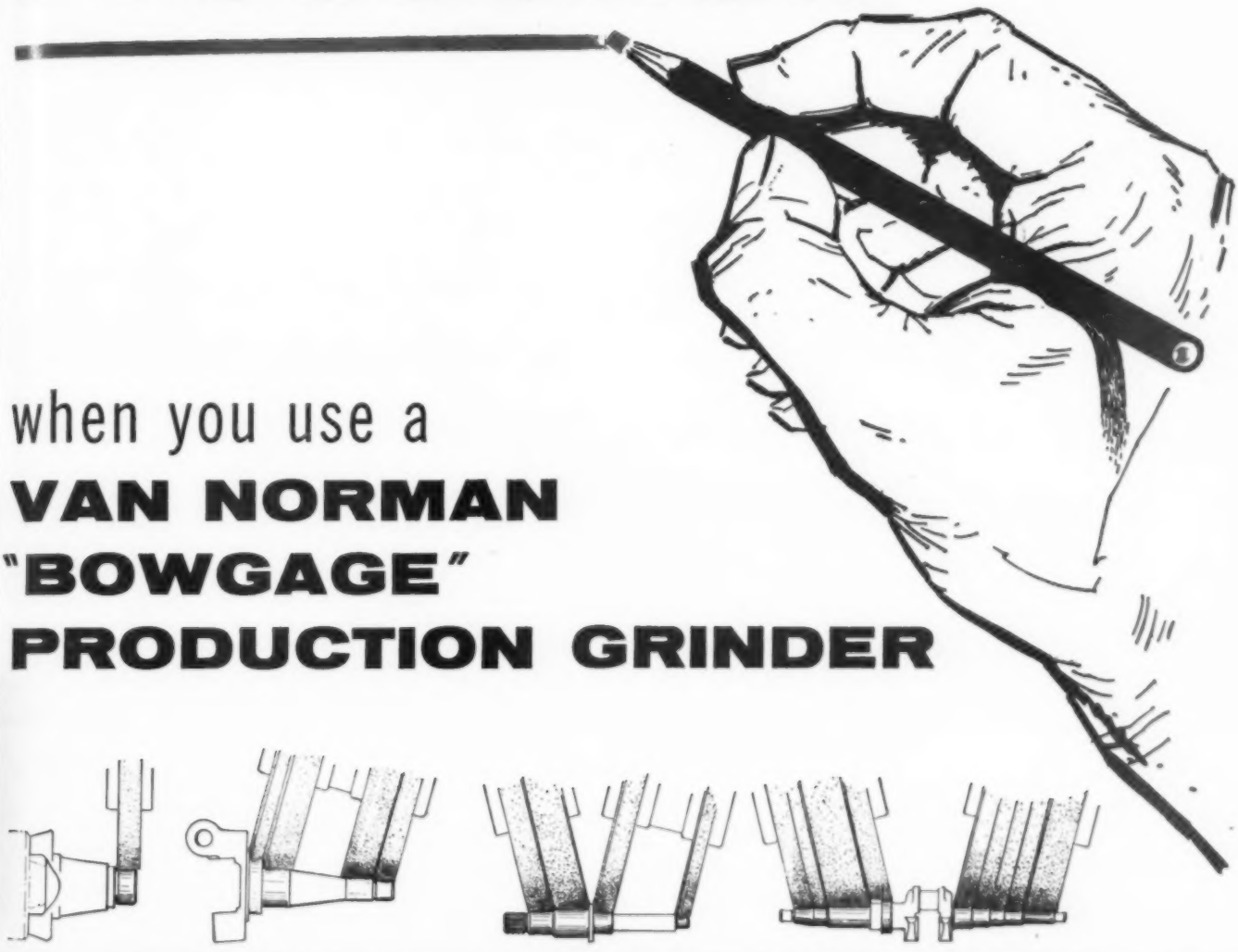
The Accent is on

Van Norman 4BG2 "Bowgage" double head production grinder illustrated. Capacity: 6" swing double work head. Grinding wheels: 30" diameter — up to 6" face. Grinding wheel motor: 10 to 20 HP.

Production



when you use a VAN NORMAN "BOWGAGE" PRODUCTION GRINDER

Here are sketches of several actual applications performed for users of single and double head Bowgage Production grinding machines

"Engineered for the job," the Van Norman 4BG "Bowgage" Production Grinder gives you accurate, fast, economical mass production.

Actual case histories on these massive grinders continually show substantial savings by keeping production up and costs down.

Van Norman production grinders can help you with your mass production problems. Write, wire or telephone, today, for complete details on the Van Norman 4BG "Bowgage" Production Grinders.

Don't wait . . . for extra profit install a Van Norman "Bowgage" Production Grinder now! They are available in many purchase plans . . . Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate up to 10 years. Conditional Sales Contracts not available to Export.

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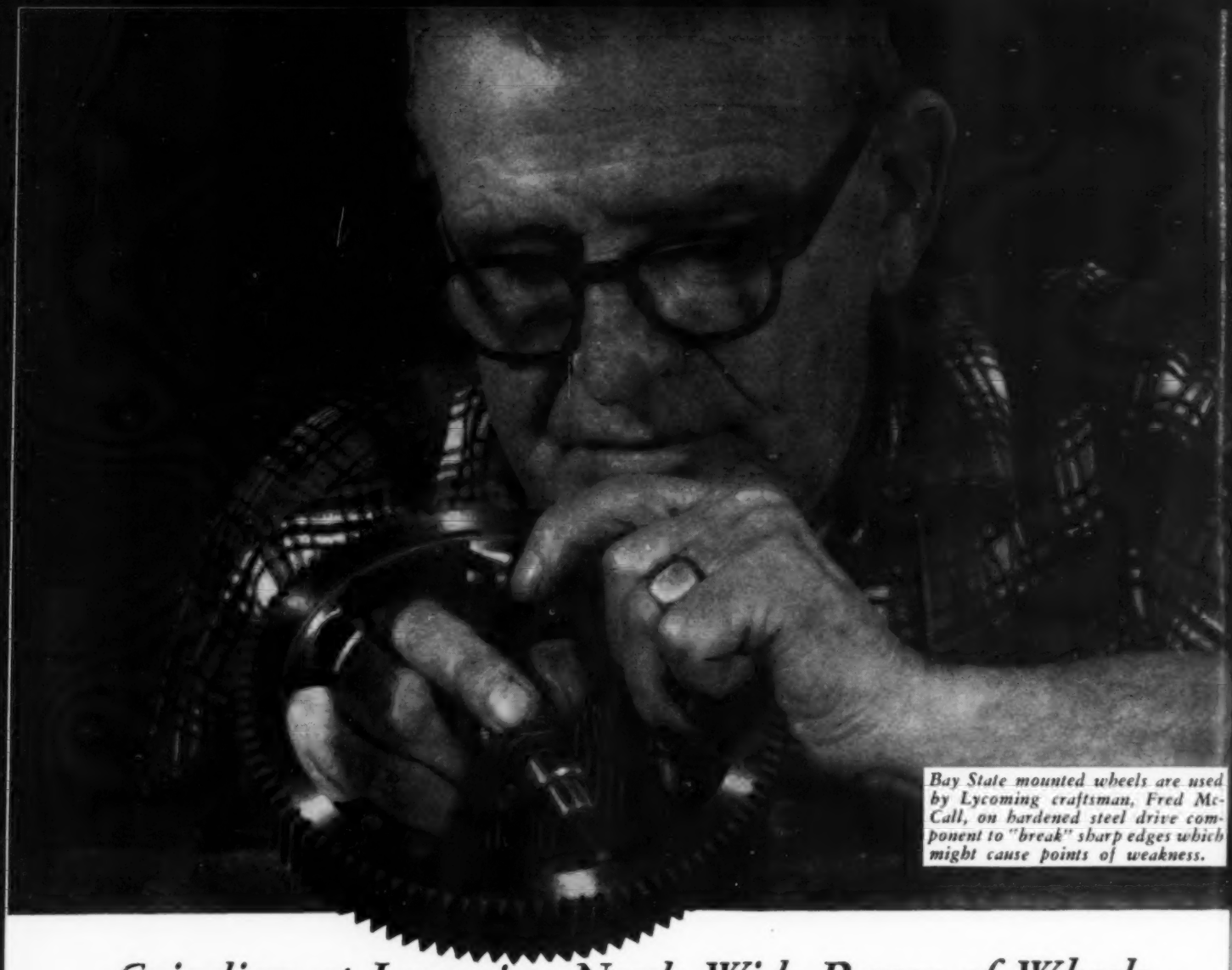


Bay State mounted wheels are used by Lycoming craftsman, Fred McCall, on hardened steel drive component to "break" sharp edges which might cause points of weakness.

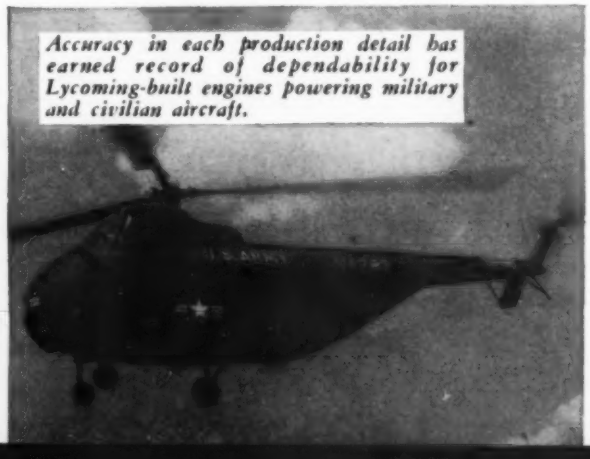
Grinding at Lycoming Needs Wide Range of Wheels — Versatile Engineering

TO the Lycoming Division of Avco Manufacturing Corporation at Stratford, Connecticut, *dependability* in aircraft engines is as important a product as the engines themselves! And precision grinding, in many forms, helps produce this built-in dependability.

For example skilled deburring of the accessory drive gear component shown on this page is important because sharp edges could set up points of weakness . . . and human life will be at stake.

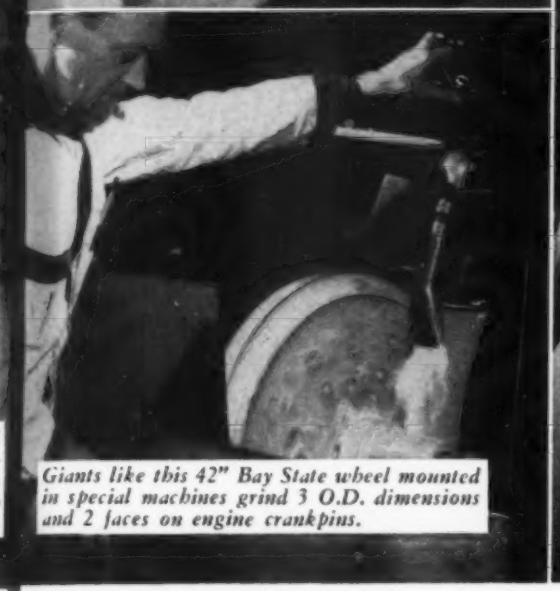
On these carburized steel parts with surface hardness to Rockwell C, a small spherical wheel of exceptional durability is needed to do the job neatly and precisely. A wheel too soft grooves quickly and leaves a ragged edge, needing another operation to finish it. Bay State specified, and manufactures for this job, a wheel that skillfully combines the necessary hardness with a clean cutting action which leaves no surface burn — also important because all parts must pass 100% acid-etch inspection.

Specifying and faithfully reproducing these efficient small wheels is one important Bay State contribution to the dependability of Lycoming-built engines.

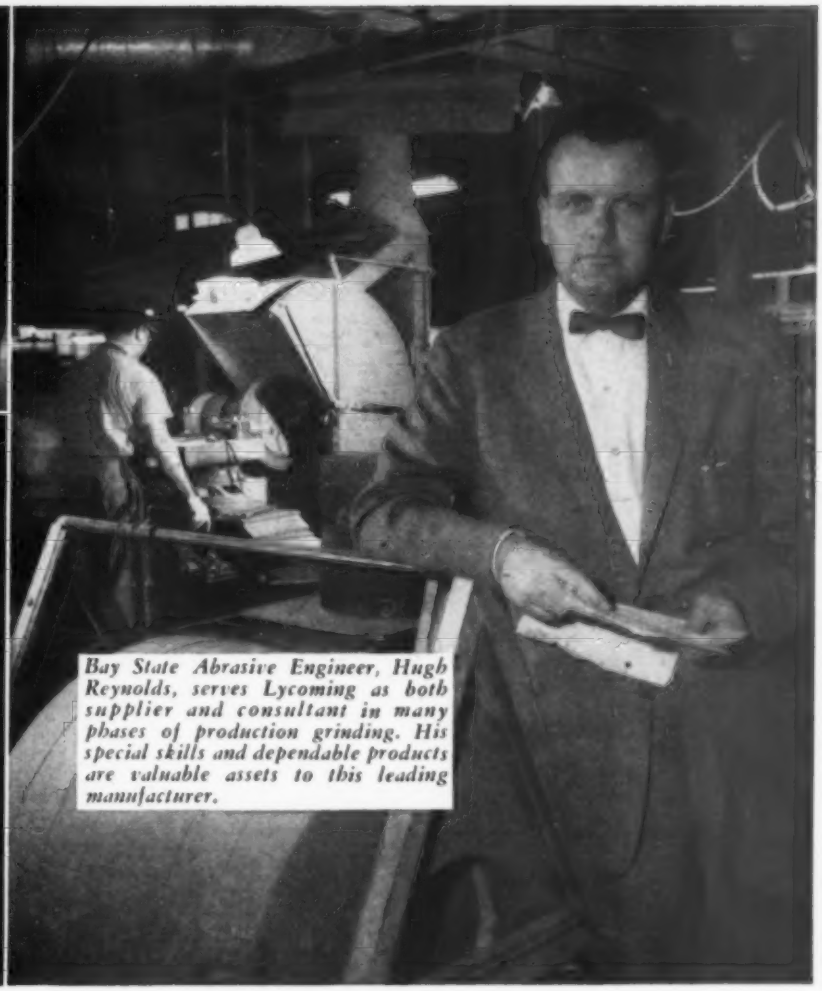


Accuracy in each production detail has earned record of dependability for Lycoming-built engines powering military and civilian aircraft.

Precision ground parts must meet the most rigid Lycoming standards of surface finish as well as dimensional accuracy.



Giants like this 42" Bay State wheel mounted in special machines grind 3 O.D. dimensions and 2 faces on engine crankpins.



Bay State Abrasive Engineer, Hugh Reynolds, serves Lycoming as both supplier and consultant in many phases of production grinding. His special skills and dependable products are valuable assets to this leading manufacturer.

In the larger grinding wheel sizes, too, Lycoming depends on Bay State for many critical operations. The multi-purpose cylindrical grinding set-up illustrated above is a typical case.

This special Landis grinder mounts a mammoth wheel, 42" x 6" x 12", specified by Bay State to perform a series of precision grinding operations on engine crank-pins. Three different O.D.'s and two faces are ground on this critical component, removing from .015 to .050 stock. The part made of AMS-6415 nitriding steel is finish ground in the soft state at about 35 Rockwell C. The successful Bay State specification was selected for its ability to produce fine, uniform finish, yet hold its corners for long productive periods between dressings.

At Lycoming and other plants, Bay State engineers are solving grinding problems . . . applying grinding wheels from the smallest to the largest . . . specifying grinding wheels for every purpose, every type of machine.

With confidence, call in Bay State through any of its branch offices or distributors.

BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Mass., U. S. A.

Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh.

Distributors — All principal cities • In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

BAY STATE ® WHEELS of PROGRESS

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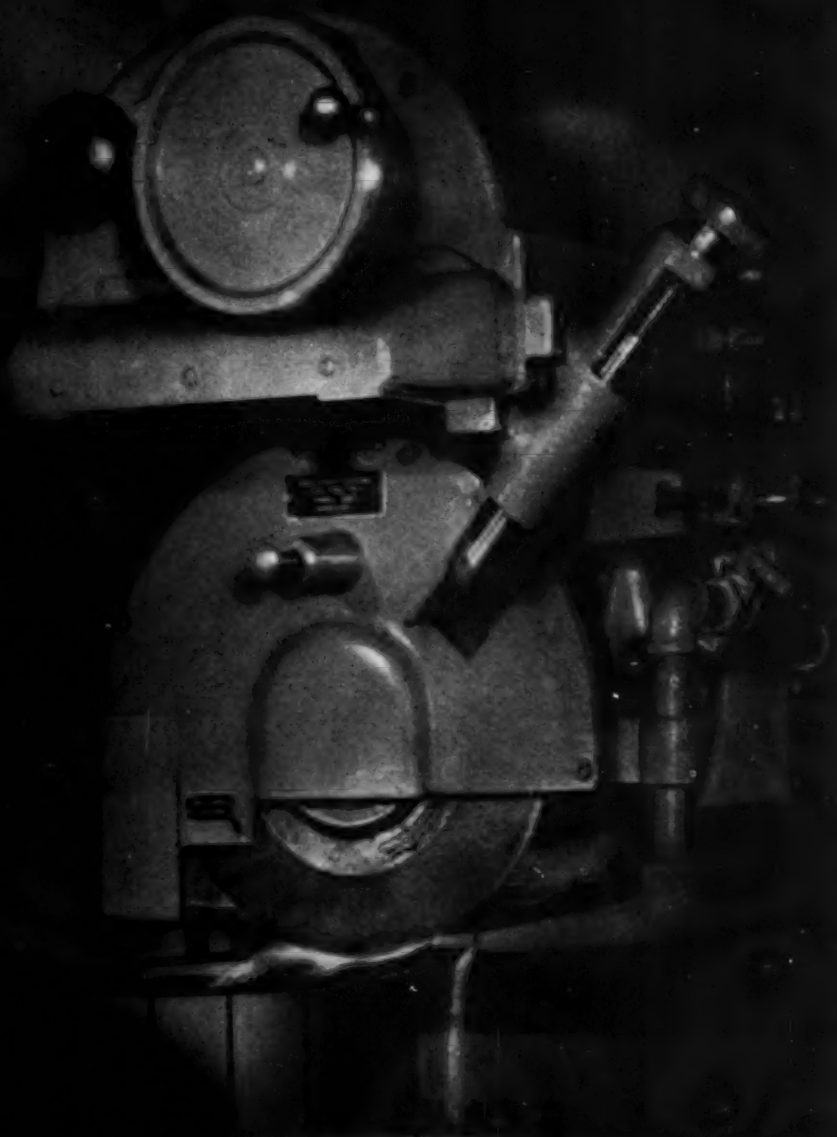
WORLD'S MOST COMPLETE LINE

# of hydraulic surface grinders



invites your attention...

name the surface grinding job... Thompson has the machine

Thompson Type B

Surface dies or parts faster to part print, at lower cost, within wide size range

work size

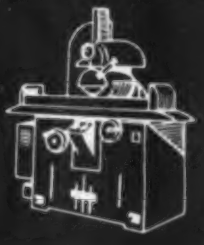
6" x 18" to 12" x 120"

Thompson Type F

For greatest precision, sensitivity and versatility in toolroom... or parts production at low cost

work size

6" x 18" and 8" x 24"



Thompson Type C

Meets production and cost demands in larger size surface work of all types

work size

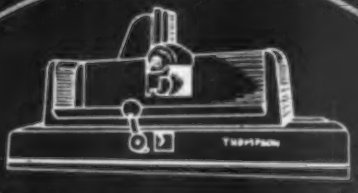
12" x 40" to 24" x 168"

Thompson Type CX

Offers both power and precision for heavy duty production...fast, accurate

work size

30" x 72" to 36" x 240"



Thompson SURFACE Grinders

Including a complete line of Truform, Hydrail, Twin Rotary and other special grinders for all sizes and types of work.

write for descriptive data

THE THOMPSON GRINDER COMPANY

SPRINGFIELD, OHIO

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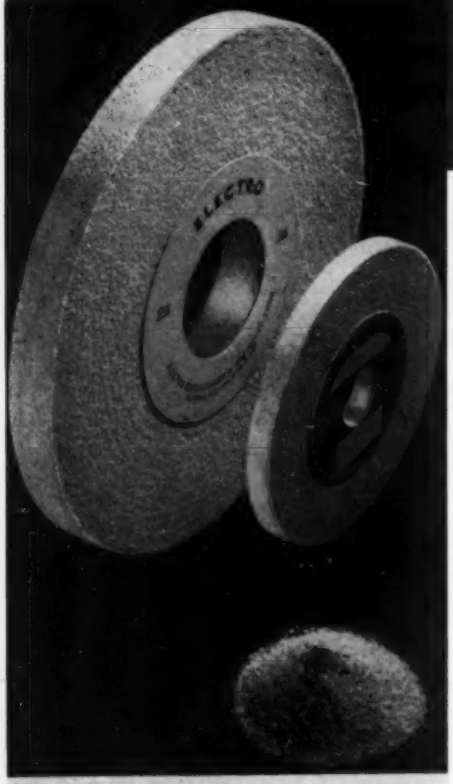
NEW 8-A PRECISION and TOOL ROOM GRINDING WHEELS

Electro TRADE MARK SINCE 1919



TESTS SHOW THEY ARE 8 WAYS BETTER!

CHECK FOR THE PROPERTY YOU WOULD LIKE...

- ☐ 1 Premium grinding action from non-premium priced wheels.
- ☐ 2 Exact duplication, one wheel to the next.
- ☐ 3 Faster cutting action.
- ☐ 4 Hold a good corner.
- ☐ 5 Less dressing.
- ☐ 6 Longer wheel life.
- ☐ 7 Cooler cutting for heat sensitive steels.
- ☐ 8 Available in our new open "20 STRUCTURE" series.

8-A WHEELS have been thoroughly proven on a wide variety of applications. We urge you to √ check for (8A) uses in your plant.

ELECTRO presents a definite product advancement in the never ending search for better vitrified bonded grinding wheels.

Electro Refractories & Abrasives Corp.
BUFFALO 11, NEW YORK

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grinder, our cover story this month, is shown on page 32 in an exclusive coverage.

Speaking of new machines, GRINDING AND FINISHING editors were shown some spectacular large grinders at Mattison Machine Works' press showing on April 23rd, just as this issue was "put to bed." The four large machines, comprising Mattison's "Hall of Titans," will be featured in the June issue. One of them is a new-from-the-ground-up double-column plano grinder for surfacing extremely large workpieces. Outstanding feature of all the machines is their "beef" and high horsepower, indicating their end use in heavy stock-removal operations. One face grinder, the 900SS, was equipped with a 150 hp motor spindle, and as Alan Mattison, president of the firm, remarked, "No one is willing to bet that this is a ceiling on horsepower."

As we go to press, indications from the National Machine Tool Builders' Association are that tool shipments lately are being made at an ever increasing pace. This to us shows the builders' willingness to remain flexible and to expand their capacity for years of heavy ordering such as we saw in 1956.

One very disturbing item comes to us from the Department of Defense. The Department is going on record as favoring a policy of protecting "trade secrets" in industry which are related to metal processing techniques. A metalworking magazine like ours naturally opposes such a clampdown on the exchange of helpful technical information, for it is our lifeblood and the lifeblood of our readers who look to us for solid information each month. We wonder if the Defense Department has contemplated what might happen in a time of national emergency if ideas aren't exchanged on a free basis, through the technical press, through societies, and so on. The dope on processing of many of the newer metals coming into use is one example. Let's have your thinking on this.

SPARK TEST

Shows how a Taft-Peirce No. 1 Surface Grinder Repeats to .00005"

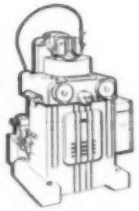
Here is a surface grinder so accurate that few people would believe it until this simple demonstration was devised.

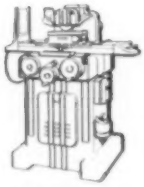
Take a side wheel grinding setup. Grind to a zero reading on the cross feed dial. Move the work away one or two thousandths with the cross feed vernier, then back to its original position. NOTE: There's no grinding spark. Now, feed in ½ of a tenth with the vernier and SEE THE GRINDING SPARK.

To our knowledge there's never been a standard grinder built before that even comes close to the accuracy of a T-P No. 1 Surface Grinder. An experienced operator frequently can grind to less than .00005" . . . with surfaces so smooth, in many cases, they seal without lapping.

Table, saddle, and column travel on anti-friction bearings retained in vees of hardened and ground alloy steel. Tilting wheelhead simplifies setups. Vernier fine-feed attachments, graduated in .0001" increments spaced ½" apart, are available for either the horizontal or vertical feed.

Compact, yet heavier than other machines, the No. 1 Surface Grinder maintains its accuracy over many years of rugged service. For more information, write for bulletin.


Rotary Surface Grinders


Precision Surface Grinders

Lapping Machines

Back Spot Facing Machines

T-P means Top Precision T P

THE TAFT-PEIRCE MANUFACTURING COMPANY · WOONSOCKET, RHODE ISLAND

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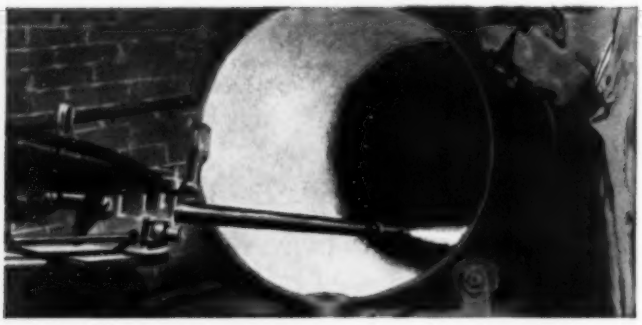
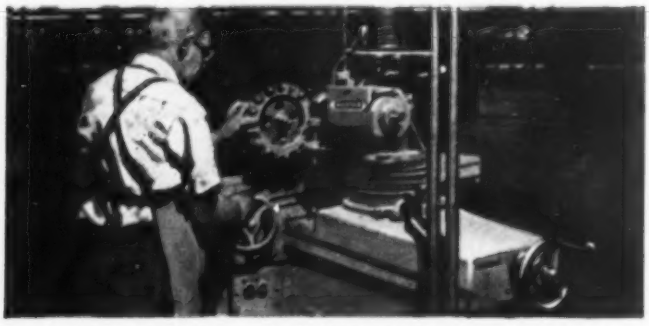
10-Ton Pulpstone Chews Up Logs . . . makes pulp for paper products. Norton made the first mammoth pulpstone in 1926; in 1956 most of the world's groundwood pulp was produced by Norton pulpstones.

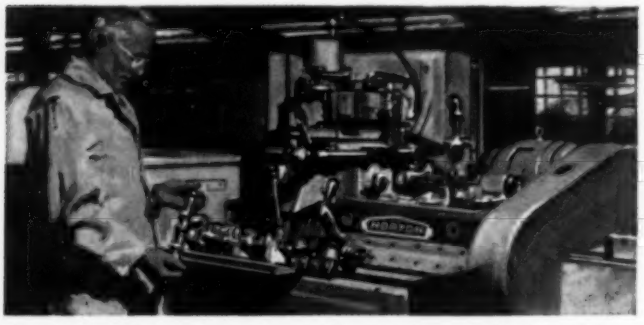
From the mammoth to the



Rokide Spray Coatings protect metal surfaces from high temperatures encountered in jets and rockets. ROKIDE* ceramic coatings are another recently patented Norton development.



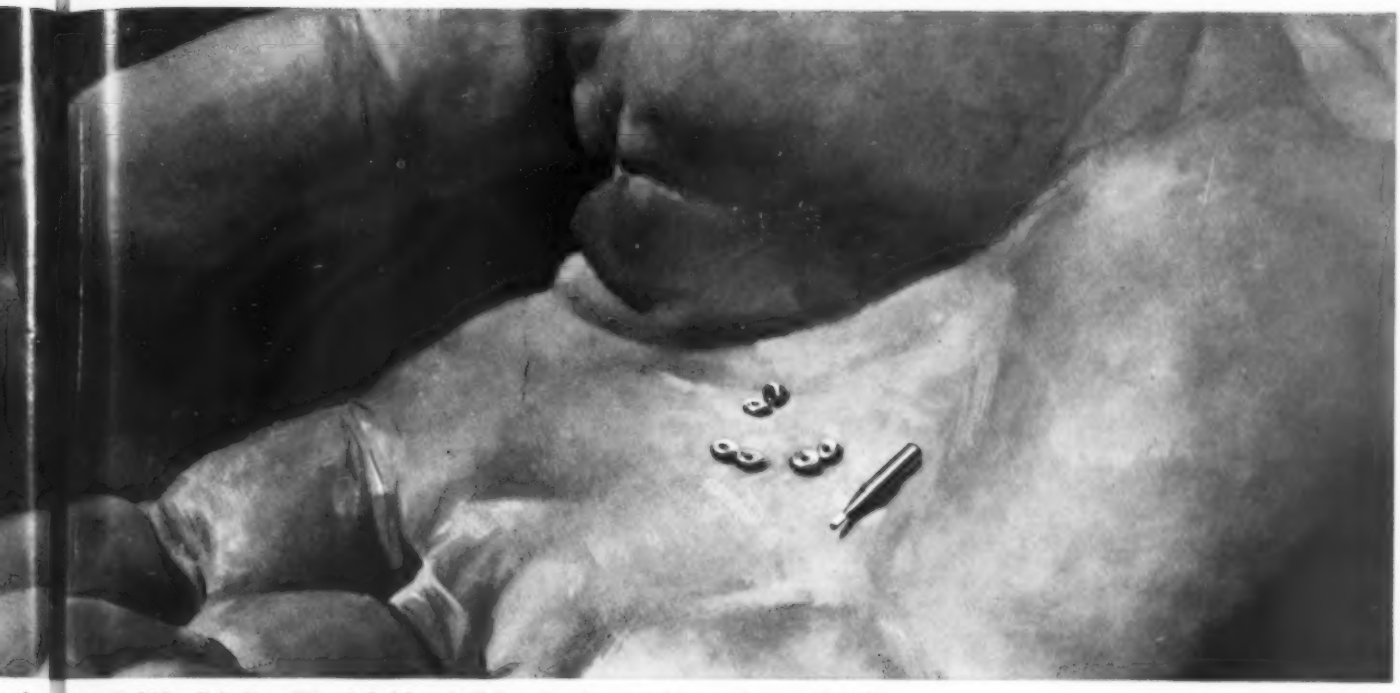
Tools for Tools. Norton grinding wheels sharpen the tools that make the product. Here a large milling cutter is sharpened by a Norton grinding wheel on a Norton grinding machine.



Over 1000 Surfaces in an Automobile require grinding to achieve perfect fit and finish. Norton has been an essential supplier to the automotive industry for over 50 years.

Tumbling Act cuts finishing costs. Here Norton TUMBLEX* abrasive is used for precision tumbling. Norton is a pioneer in modern barrel-finishing materials and techniques.

Making better products...



Tiny Rokide Grinding Wheel finishes ball bearing bore no larger than a pinhole. This spindle-type grinding wheel is only .040" in diameter.

e tiny through the busy years

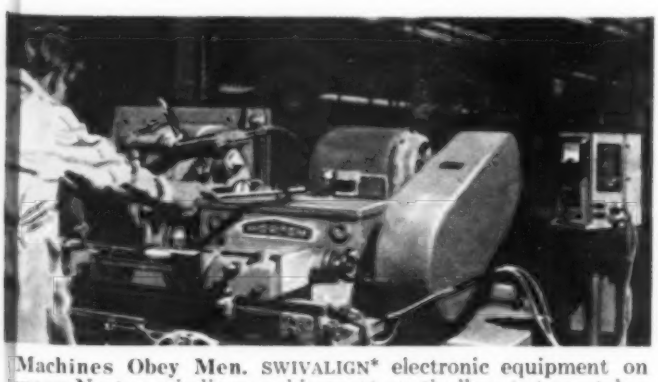
It's surprising how many different kinds of abrasive wheels the world needs.

Here one wheel chews logs into pulp — the other polishes holes of pinhole size in miniature bearings. Both are examples of Norton Company's broad scope in supplying abrasives to industry.

Did you know that Norton Company makes more than 200,000 different kinds and sizes of abrasive products — and that it has a continuous improvement program for all of them? The mammoth Norton pulpstone was a "first" in 1926. The miniature ROKIDE grinding wheel was a "first" in 1956. Between the two are literally hundreds of "firsts" that helped some one industry or some one manufacturer make an improvement or cost reduction in product or process.

That's why Norton sees its job as "making better products to make your products better."

NORTON
ABRASIVES



Machines Obey Men. SWIVALIGN* electronic equipment on many Norton grinding machines automatically sets taper tolerances as dictated by the operators — closer than eyes can see.

Across the world and still expanding

Abrasive and Grinding Wheel Plants—Worcester, Mass.; Santa Clara, Calif.; Hamilton, Ontario; South Africa; England; France; Germany; Italy; Brazil. **Behr-Manning Plants**—*Coated Abrasives and Behr-cat Tapes*—Troy, N. Y.; Canada; Australia; France; Northern Ireland; Argentina; Brazil. **Electric Furnace Plants**—Huntsville, Alabama; Chippawa, Ontario, Cap-de-la-Madeleine, Quebec; Brazil. **Grinding and Lapping Machine Plant**—Worcester, Mass. **Refractories and Electro-Products Plant**—Worcester, Mass. **Norton Pike Plant**—*Sharpening Stones*—Littleton, New Hampshire. **Bauxite Mines**—Bauxite, Arkansas.

General Offices: Norton Company, Worcester, Mass.

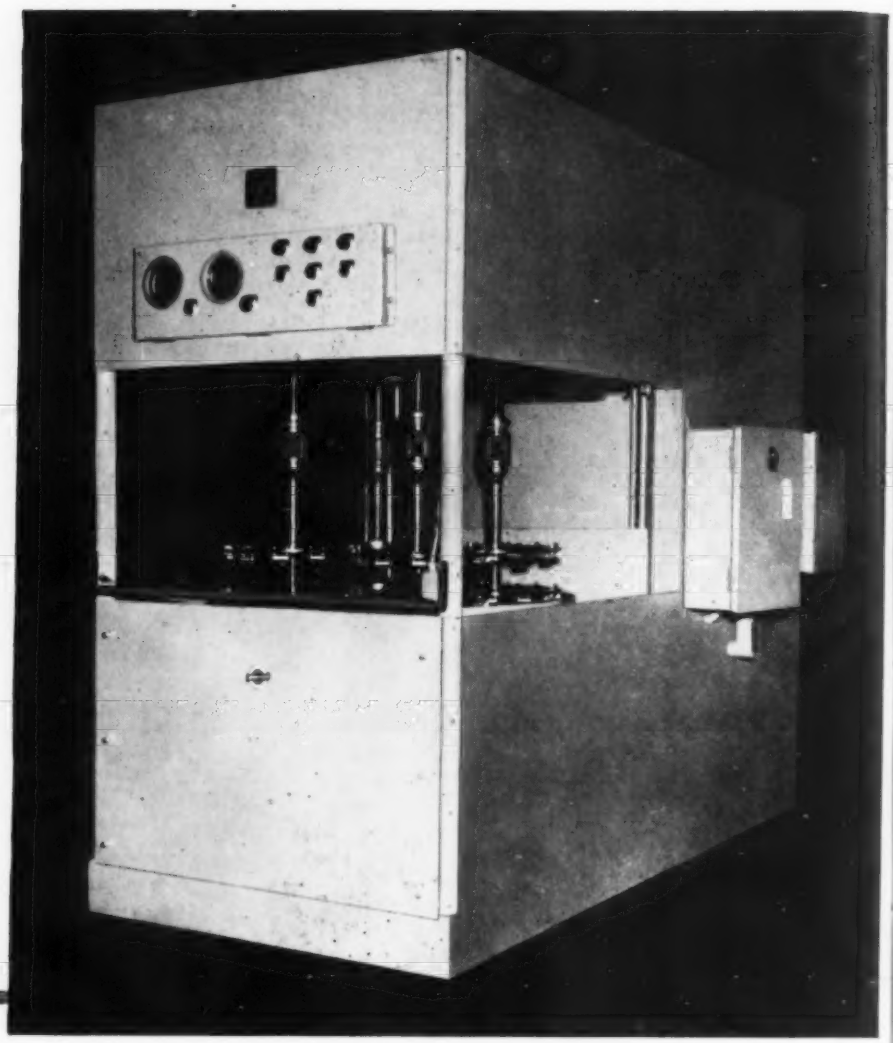
*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

. to make your products better

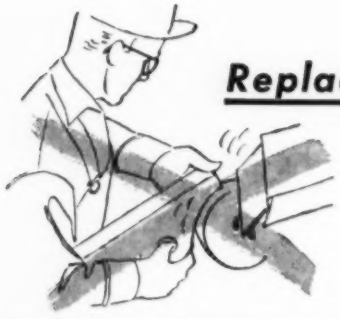
TUMBLE
GRAV-I-FLO
FINISH

OFFERS

Spin-Finish



AN ENTIRELY NEW PARTS-FINISHING PROCESS



Replaces hand and automatic buffing!

- ☑ One-operation finishing, even of the most complex parts
- ☑ Completely dry process . . . no lubricants needed
- ☑ Dust and fume free . . . no need for exhaust or ventilating systems
- ☑ No set-up time required for changing jobs

Sets New Standards In Pre-Plating Finishing Costs

Wipe the slate clean of all present concepts of speed, efficiency and costs in pre-plating finishing of brass, zinc-base and aluminum die-cast parts! In one short, automatically-timed operation—and on a *multiple mounting* of parts—new SPIN-FINISH produces surfaces and lustre equal to or surpassing that of buffing.

Savings on time, labor and plant space are tremendous! Eliminated are vast exhaust and ventilating systems! You'll want to learn all about this startling revolutionary method of finishing. Write for complete information now.

GRAV-I-FLO CORPORATION

Dept. GF 5, 400 Norwood Avenue, Sturgis, Michigan

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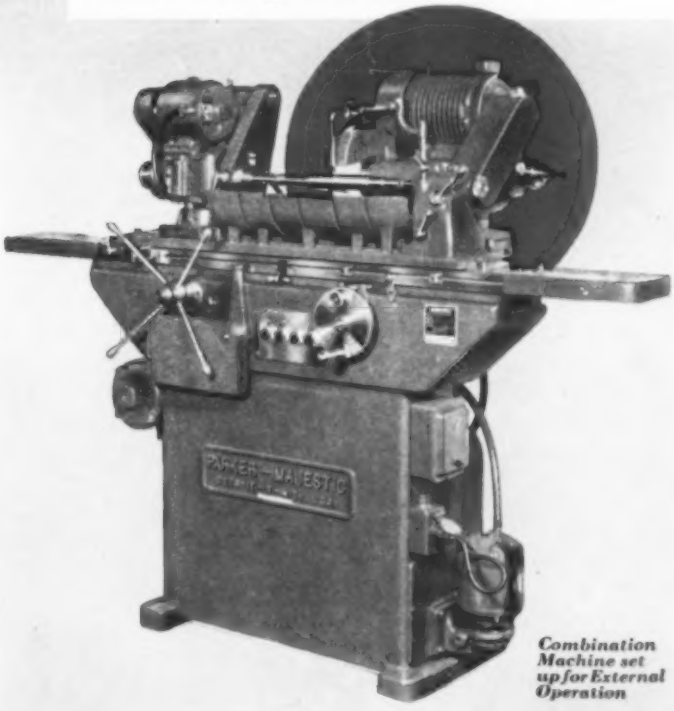
PARKER · MAJESTIC pm PRECISION MACHINES

NOW A COMBINATION INTERNAL/EXTERNAL GRINDER

Combination Machine set up for Internal Operation

PARKER-MAJESTIC *presents the well known Internal and External Grinder shown here as a combination unit.*

- **One spindle mounting bracket performs both operations.**
- **Quick changeover—Loosen only four nuts and swivel bracket 180° to bring spindle into operating position.**
- **12″ swing over table.**
- **Horsepower rating maintained in new totally enclosed motor design; drive pulleys mounted on either end of motor.**
- **Internal spindle driven by flat belt in conjunction with spring loaded idler assembly of new design.**
- **External spindle driven by timing belt requiring little belt tension.**
- **Operator protected by well designed guards.**



Combination Machine set up for External Operation

PARKER-MAJESTIC, INC.

147 Joseph Campau • Detroit 7, Michigan

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At the AASA convention, Atlantic City, Hitchcock's Bruce Howat (center) takes his information first hand from G. L. Runkle (left), Vice President in charge of engineering, and G. L. Hartman, Chief Product Engineer of Superior Coach Corp.

THE MAN FROM HITCHCOCK

A lot of spade work goes with digging for editorial material that qualifies for Hitchcock publications. Bruce Howat, editor of Mass Transportation, M. T. Directory and School Bus Trends doesn't take his facts sitting down. He and his staff get up from behind their desks and go after them—into the field where events are taking place and people are doing things that shape the transportation industry's future.

Editorial field activity spells out Hitchcock emphasis on first hand reporting, to provide the finest editorial framework within which your sales message is assured top readership and buyer action. The editorial men from Hitchcock will continue to go places, do things, talk to people who shape the industries they represent. By so securing reader interest, will Hitchcock publications return with interest full value for every dollar invested in their advertising pages.

METALWORKING

Machine & Tool Blue Book
Machine & Tool Directory
Grinding and Finishing
Carbide Engineering

WOODWORKING

Hitchcock's Wood Working Digest
Hitchcock's Wood Working Directory

TRANSPORTATION

Mass Transportation
Mass Transportation's Directory
School Bus Trends

hitchcock
PUBLISHING COMPANY
WHEATON • ILLINOIS
SINCE 1898

THE PIONEER OF CONTROLLED CIRCULATION

Three 6-18 Models . . .
for Toolroom and Production Grinding

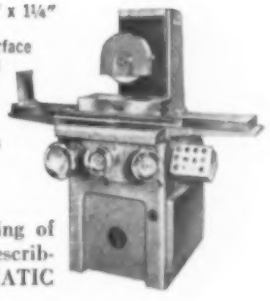
REID . . . the quality name in surface grinders . . . now has three different models in the 6" — 18" size. If your production schedule demands maximum automation, there's a REID 618P with power table and power cross feed. A REID 618PT with power table and hand cross feed is also available.

For tool and die makers, the hand operated 618H is ideal for precision grinding. On all models, a Cross Slide Lock is included as standard equipment.

Compare . . . check the extra features on all REID grinders . . . and standardize on quality. For complete details on models shown, write for Bulletin 618.

SPECIFICATIONS

Capacity: 6" wide, 18" long, 17¼" from spindle center to table. Standard wheel 7" x ½" x 1¼" included
Worktable: 51" x 8" overall; 6" x 18" working surface
Table Speed: Infinitely variable from 12 to 35 FPM
Cross Feed: Infinitely variable from .006"to.100"
Floor Space: 71" x 43½"
Weight: 2400 lbs.
Electrical: 3 phase, 60 cycle, 220, 440 or 550 volts
All Models Equipped with Automatic Lubrication as Standard Equipment



For Toolroom and Production Grinding of larger capacity, write for bulletin 824 describing our New All Electric 8-24 REID-O-MATIC Surface Grinder.

REID BROTHERS COMPANY, Inc.

133 Elliott Street, Beverly, Massachusetts

MANUFACTURERS OF PRECISION SURFACE GRINDERS AND PRODUCTION LATHES

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Can you afford to gamble on surface finish?

Today's more exacting quality standards have added a new dimension to every machined part. This dimension is *surface roughness* and it is now recognized as an important factor in machining costs. Yet, because of inaccurate measurement of this important new dimension, parts are often over finished and costs soar . . . or parts are under finished and product trouble develops.

Surface finish can be measured accurately

Unnecessary finishing expense can be prevented. A remarkable measuring instrument has been developed that permits *anyone* to make accurate surface finish measurements. Called the Brush SURFINDICATOR*, it permits checking of every finished or in-process surface in accordance with industrial and military specifications. The SURFINDICATOR can be operated without special training—a hand-held stylus is simply stroked over the surface to be measured and a direct reading taken in micro-inches. Completely portable, the SURFINDICATOR is designed for use where it's needed most—at the machine. Extremely accurate, it is the lowest cost method of finish control.

The Brush SURFINDICATOR offers a fast reliable means of accurately measuring surface finish . . . completely portable for use anywhere in your plant, weighs only 15 pounds.

Precision Reference Specimens are provided with every instrument as a quick calibration check to permit field adjustment for absolute accuracy.

Full information on the cost-saving Brush SURFINDICATOR and ASA Standards contained in descriptive booklet . . . new Brush Surface Finish Control Efficiency Study can help evaluate surface finishing.

The complete story on how surface finishing costs can be controlled is contained in our booklet describing the Brush SURFINDICATOR. To help you in evaluating over and under finishing in your plant, a Surface Finish Control Study form is also available. Write for both—they can provide you with a new insight to the cost savings possible through accurate surface finish control.

*T. M.

BRUSH ELECTRONICS COMPANY

3500 Perkins Avenue, Cleveland 14, Ohio

BRUSH 6 ELECTRONICS

DIVISION OF CLEVITE CORPORATION

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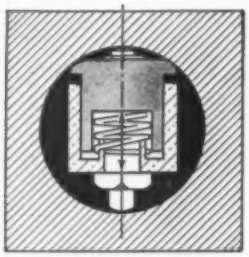
Precision Requires Special Treatment

...AND GETS IT WITH FEDERAL DIAL GAGES!



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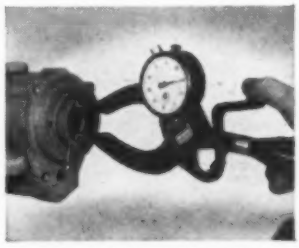
Positive Centralization. Set directly to Gage Blocks or Micrometers. 4 sizes cover all diameters.

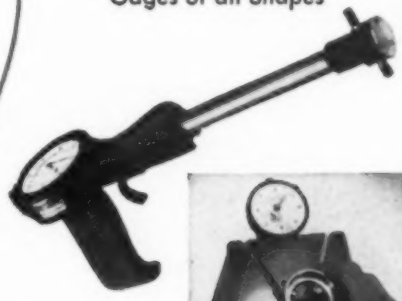
DEPTH GAGES
All types—knife edge, long range, special anvils and special types.

GAGES CAN BE MODIFIED SPECIALLY TO SUIT . . .

OVER 12 *TYPES* OF SNAP GAGES — *in all sizes . . .*



Stock and Special Caliper Gages of all Shapes



GROOVE GAGES
I.D. • O.D. • Depth
Concentric • Width

OVER 12 *TYPES* OF HOLE GAGES — *in all sizes . . .*

If you are not kidding yourself about Precision you know you have to gage a dimension a certain way if you want an accurate measurement.

That's why good gage users know that just *any* gage is *not* good enough. And that is why Federal makes so many different types of gages of the same general kind.

There are all degrees of accuracy required and Federal takes the care to obtain that accuracy.

And some need more gaging pressure, and some less, and some need narrow anvils and some need wide. Some want to gage just a hole diameter and some want to know if it's round or if it tapers.

MANY OTHER TYPES
Send for Catalog. Illustrates the most extensive line available.

It's easy to find the gage you need — get in touch with us. Do it now.

FEDERAL PRODUCTS CORPORATION
7445 Eddy Street • Providence 1, R. I.

Whatever You Need in Gages —

Ask FEDERAL *First*

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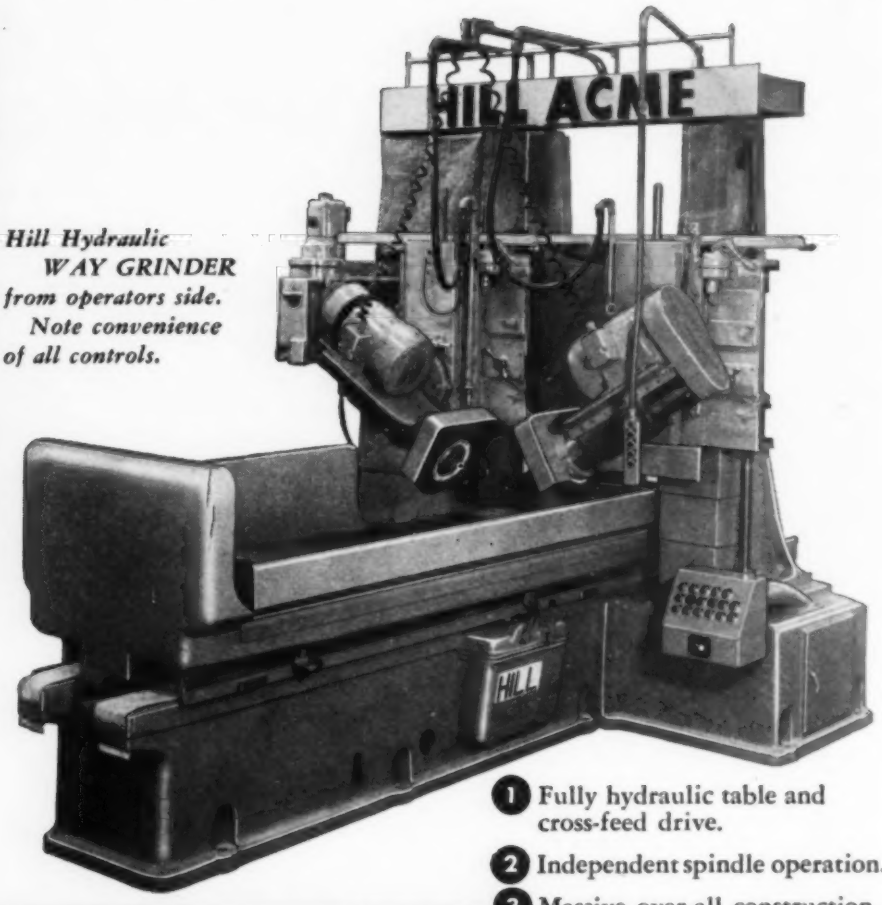
HILL double housing WAY GRINDER for accurate grinding of V's, Flats and Angles

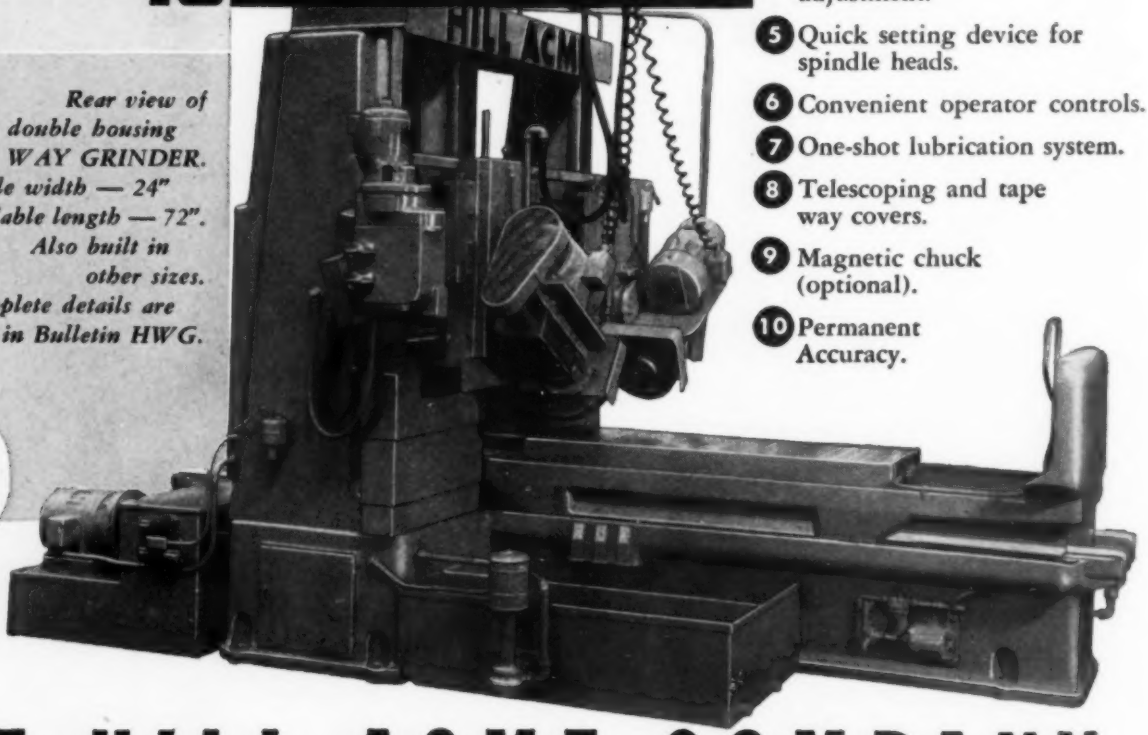
Substantial Savings (up to 50%) over previous methods.



Hill Hydraulic WAY GRINDER from operators side. Note convenience of all controls.

10 points worth considering

1. Fully hydraulic table and cross-feed drive.
2. Independent spindle operation.
3. Massive over-all construction.
4. Rapid traverse and fine feed adjustment.
5. Quick setting device for spindle heads.
6. Convenient operator controls.
7. One-shot lubrication system.
8. Telescoping and tape way covers.
9. Magnetic chuck (optional).
10. Permanent Accuracy.



Rear view of HILL double housing WAY GRINDER. Table width — 24" Table length — 72". Also built in other sizes. Complete details are given in Bulletin HWG.

HILL ACME TOOLS FOR INDUSTRY

THE HILL ACME COMPANY

1209 WEST 65th STREET • • • CLEVELAND 2, OHIO

"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING THREADING • TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES

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Grinding and Finishing

Editor's Page

What Price Overfinishing?

Is overfinishing—obtaining a microinch finish substantially lower than called for on the part print—adding unnecessarily to your manufacturing costs?

A well-intended remark we hear over and over from operators and foremen in metalworking shops is, "Sure, the print calls for a 32 micro finish, but I'm getting a 16 right along."

This sort of well-meant but misguided "workmanship," if it's happening in your shop, should be regarded with suspicion, for it may be costing you more than you suspect. Manufacturing cost per piece climbs sharply when, even on the same machine an operator produces a finer finish than the designer specified. Finishing a part beyond the point of function is obviously wasteful.

When accurate means of measuring surface finish became available about 20 years ago, a great segment of American industry went overboard on the subject of fine finishes. This trend to ultrafine finishes usually dismayed the production people. Operators were asked to get the finest finish possible out of a job, and we've no doubt that this habit has carried over to the present generation of supervision, at least to some extent.

What was the reason for the fine-finish craze? Well, carefully controlled laboratory tests of moving parts had shown the desirability of ultra-finishing from a wear standpoint. But what was overlooked was the wear-in, or break-in, period. Later research shows us that the finer finish wears in a lot slower than the rougher one, and this is a paramount consideration for typical production parts.

The progressive automotive companies who have freely published their findings on the subject of surface finish deserve a lot of praise from American industry. They learned, for example, that they'd been overfinishing cylinder bores—that too smooth a surface prevented best wear-in of piston rings. From the old specification of about 12 micro, they went to a range of 20 to 30 microinches. Piston pins are another extreme example. They used to carry a specification of 2 to 3 micro, which has been relaxed in the age of enlightenment to 6 micro-inches.

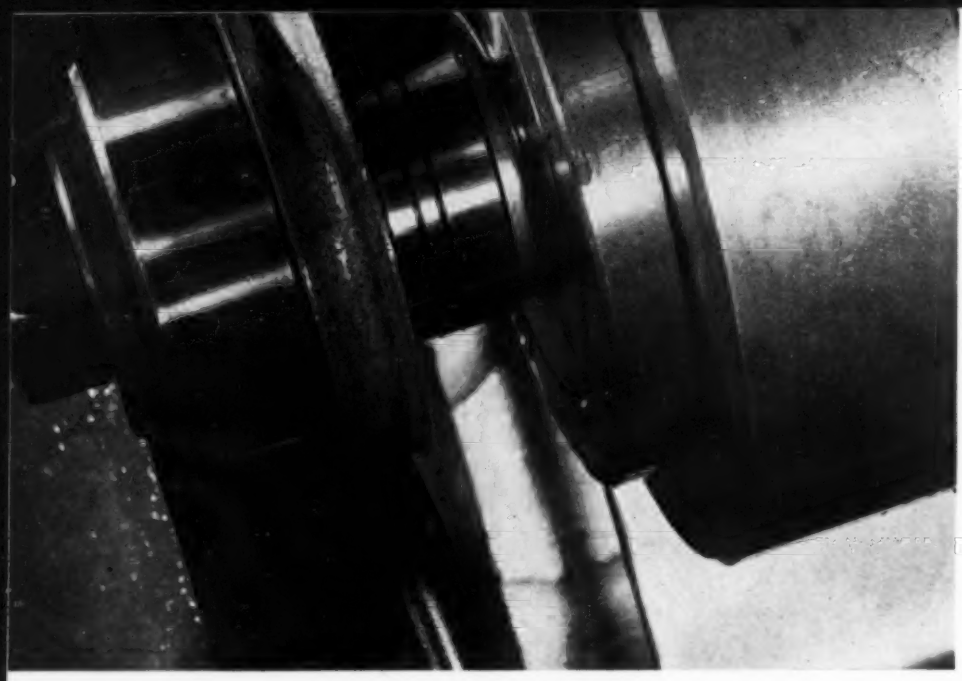
What can general metalworking shops learn from the experience of the automotive people? What gains are to be made if the surface finish question is faced realistically?

1. A second finish grind or lapping operation might be eliminated altogether, provided there isn't any sacrifice in part function.

2. A different grit combination in the grinding wheel or other abrasive tool may yield higher production with the equipment now being used on the job. The idea is to narrow the "spread" of finish obtained on a job to a band falling just below print specifications. How far below requirements, of course, has to be decided for each job.

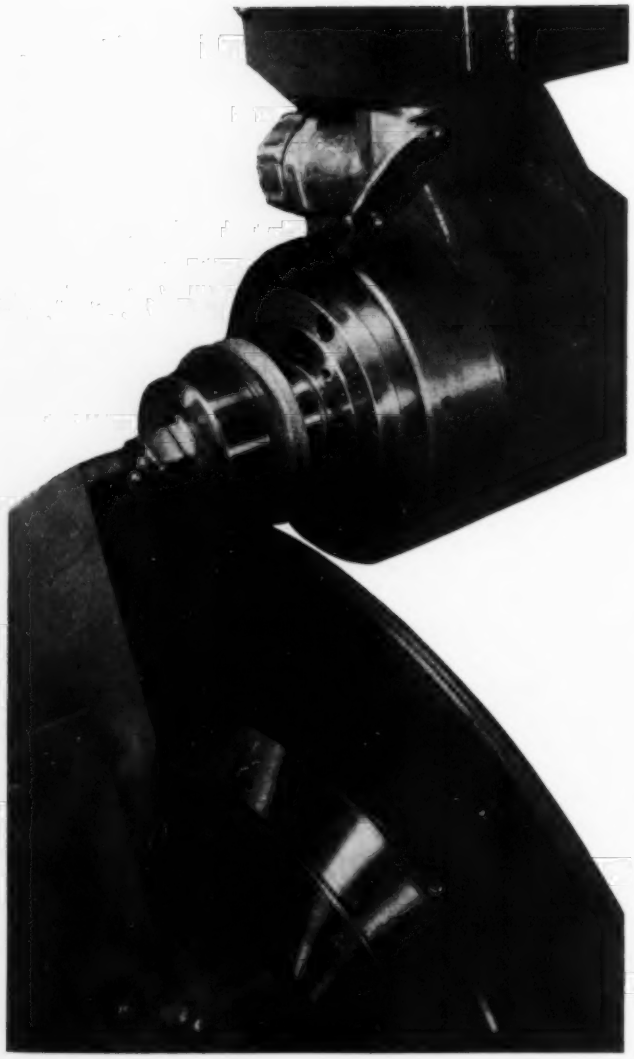
3. Shortening the machine cycle itself, without varying the tooling used, can sometimes correct an overfinishing situation, with a corresponding production increase. For example, reduction in the sparkout dwell on a grinding job, if permissible from the sizing or geometry angle, will often accomplish this.

Jack Kenyon
Managing Editor



GROOVED CEMENTED DIAMOND CUTTER, top, dresses convex form in grinding wheel for operation on steering gear part. Powered cutter maintains accurate wheel form while wheel remains at full grinding speed. Result: Grinding proceeds without interruption for dressing, and machine can be fully automated.

New Development Permits C



An interview between **William F. Schleicher,** V. P. and Editorial Director, Hitchcock Publishing Co., and **Ernest V. Flanders,** Chief Engineer, Jones & Lamson Machine Co.

Q: As I understand it you have here a development which eliminates all down time for wheel dressing, makes possible the complete automation of grinding operations, permits you to form a resinoid wheel and delivers countless other benefits. Sounds revolutionary!

A: In a way it is. There are other advantages besides those you've mentioned: Freer and faster cutting action of the grinding wheel is obtained, form grinding wheel shapes can be produced and maintained within narrow dimensional limits, etc. As time goes on we'll discover other advantages.

Q: Just what is this development?

A: Basically it's quite simple, although it wasn't simple to develop. We have a roll, like a crusher roll, shaped to the contours we want to impart to the wheel. The entire surface of the roll is covered with thousands of diamonds held in place in a metallic matrix. The body of the roll, or cutter, as we call it, is made of powdered metal. You can see this development in the photo at the left.

Q: Does this cutter contact the wheel in a crushing action?

A: No! It abrades! We literally grind the form into the wheel by means of the cutter. The cutter forms the

grinding and finishing
MAY 1957

- √ *A joint development of Jones & Lamson Machine Company and Koebel Diamond Tool Company*
- √ *Cemented diamond particle cutters replace single point diamond dressers for wheel forming*
- √ *Makes possible complete automation of form grinding operations*
- √ *Permits continuous dressing of resinoid, vitrified and other wheels*

s Continuous Form Dressing

wheel much like a milling cutter operates, with thousands of teeth set in the body in such a manner as to continuously generate an accurate form.

Q: Do you form the wheel from the solid or must there be a pre-forming, or even a pre-crushing operation first?

A: We form the solid wheel.

Cutter is Powered

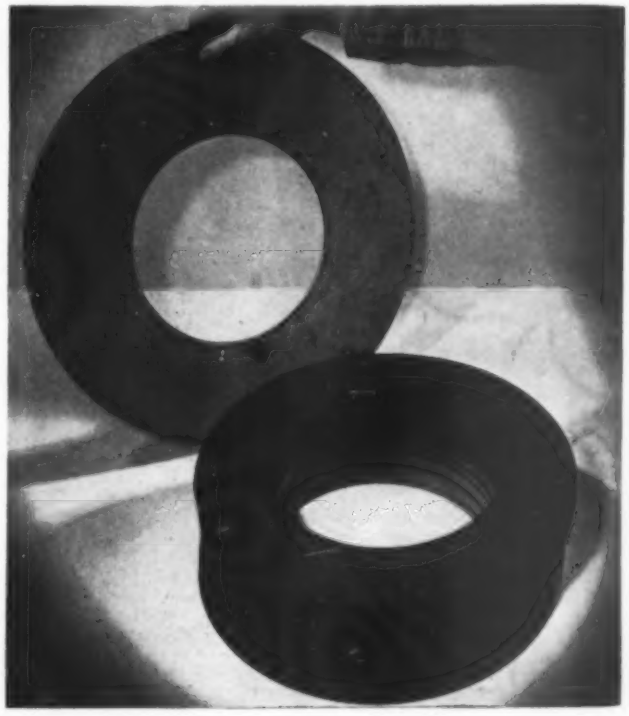
Q: You say the grinding wheel is under power while you form. Is the cutter also under power?

A: Yes. The cutter is also under power and rotated so that successive portions are brought into contact with the grinding wheel. The grinding wheel can be dressed continuously to the same shape as the cutter. The peripheral speed of the cutters allows the dressing action to take place with abrasive action between the cutter diamond edges and the grain and bond of the grinding wheel.

Q: You can also then, after you've got your form on the wheel, perform your grinding operations and mount this cutter on the back, continually maintaining form in the wheel, i.e., keeping it dressed with this cutter?

A: You can do that. We can do it in various ways. We can cycle dress, we can continually dress, or we can continuously dress with an intermittent dressing action. Of course, our machines are all tied up to compensate for wheel wear. If the wheel wears down, the diamond cutter moves forward and we maintain the grinding position of the wheel, always maintain

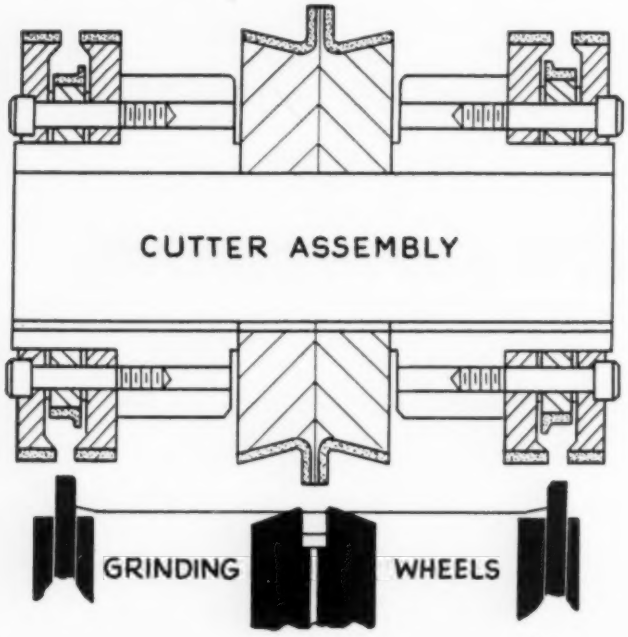
"We've never worn a cutter out. All these wheels were shaped with one cutter. They were cut down from twenty to sixteen inches. The cutter is as good as new."



New Form Grinding Development

Continued

size. We can gear that all up and drive it with a dresser cutter working on the wheel at all times, maintaining that position without paying any attention to it, or we can do it by having the cutter go in and kiss the wheel occasionally at predetermined intervals.



Q: This eliminates the human factor in wheel dressing doesn't it?

A: You are doing just that. As it's done now you have a job setter who goes around from machine to machine and adjusts the automatic wheel dresser. It takes a bit of skill on complicated forms to set the dresser. You just wouldn't let anybody do it. And then while the wheel is being dressed there's no production.

Q: And there's no need for that now, is there?

A: None at all. The operator can merely kiss the work, as I've explained, or he can cycle dress. In any case, the machine does not stop for wheel dressing. It's all automatic.

No Loss of Accuracy

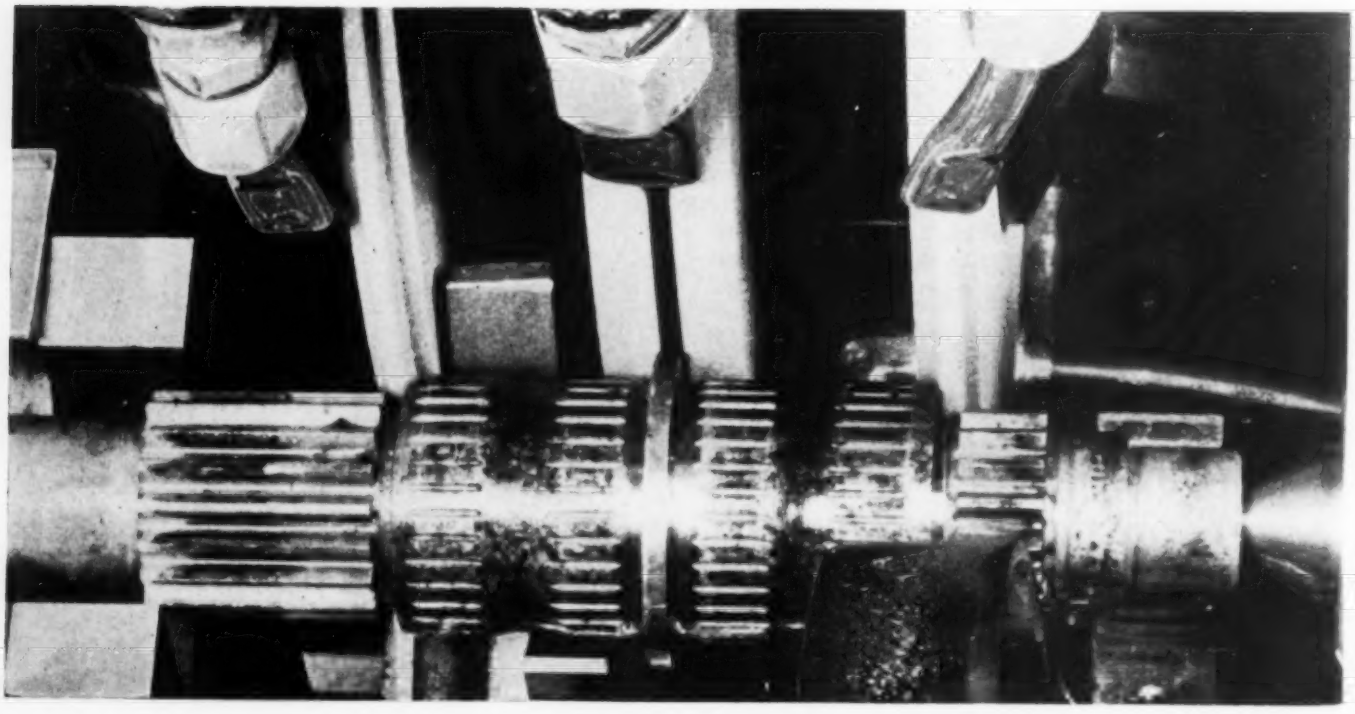
Q: How long does one of these cutters last?

A: We don't know. We've never worn one out. We've put it through some rough tests, but we wear out more wheels without the slightest visible effects on the diamond cutter*.

Furthermore, there is no loss of accuracy or finish regardless of how long you use the cutters. There's

*In the report on the Buick operation which follows this interview it will be shown that Buick has had a cutter dresser, one of the earliest, going for nearly two years without showing signs of wearing out.

GANGED CDP CUTTERS, left, form four wheels in setup being shipped to European automotive producer. Closeup below shows the four wheels and workpiece on the J&L Model E grinder.



another advantage. You get a faster cutting grinding wheel because you're dressing more often, or I should say, dressing as often as you should. In single point diamond dressing you may have a wheel loading condition just before the dressing operation takes place. This is entirely eliminated. Accuracy is never tampered with; as far as the tolerances are concerned. . . .

Q: Pardon me, sir, but before we get into dimension, tolerance and surface finish, I'd like to know what motivated your research into this and how J & L happened to get into the diamond business.

A: First, J & L is not in the diamond business. We wanted to carry automation in grinding as far as we could, but were always stopped by the dressing time which meant the grinding time had to cease during dressing. So our search for an automatic dressing method for automation led us into this. In addition, we've had several jobs which required the use of a resinoid wheel; now, you can't crush form a resinoid wheel, which was really what we wanted to do. The idea of using a formed cutter, or roll, came to mind and we thought we'd look into it. We knew the Koebel Diamond Tool Company in Detroit had developed a method of setting diamond particles in powdered metal, so we contacted them and they worked with us and developed this method of bonding the diamond particles in a matrix on a metal roll. Incidentally, we call this a CDP (Cemented Diamond Particle) cutter*. You can now form grind piece parts which had been thought impossible up to now. An entirely new field is opened up.

Q: This is a joint accomplishment?

A: Yes, it is. Both J & L and Koebel have worked on this for the last five years.

Jet Blades Next

Q: When you say a new field is opened, can you give us an example?

A: We are working on several jobs which will be form ground which up to this time have given a great deal of trouble. We think that form grinding of jet blades and other components will be possible in the near future. There are still bugs in the jet job, but they'll be licked. We have here a worm gear for Saginaw Steering. This is now form ground out of the solid. We remove four ounces of metal in a matter of 24 seconds. Entire grinding time is only 24 seconds, and no separate dressing operation is needed. It's all done simultaneously: dressing and grinding.

Q: Now, what about tolerances and limitations?

A: On straight-sided grooves for snap rings you can control the width of those grooves to within very close tolerances: tenths, half thousandths, or thousandths. On diameter we like to have plus or minus one thousandth. On radius I'd say we ought to have

*The Koebel Diamond Tool people have added another name: PFC (Perpetual Form Control), applying this to the method and retaining CDP, as referring to the cutter.

What Are Cemented Diamond Particles?

The development of Cemented Diamond Particles by the Koebel Diamond Tool Co. for use in tools and cutters for the dressing of grinding wheels is the logical continuation of products pioneered by the company to take advantage of the hardness of diamonds. The main theme of this trend has been to devise methods to use diamonds of smaller size for performing functions which were thought to be possible only by using larger diamonds. In 1930 the company patented the powdered metal technique for mounting diamonds.

As a culmination of this program "Cemented Diamond Particles" or CDP tools and cutters were developed to utilize the ultimate in smaller diamonds; namely, diamond powder.

With regard to the diamond tool manufacturer, the use of Cemented Diamond Particles in the CDP product allows him, in his manufacturing operations, to use a uniform starting raw material (diamond particles), rather than large whole diamonds of varying size, shape and degree of perfection. In addition, the consequences of using several diamond points in the trueing device are important. First, each tool or cutter during its entire life performs in the same manner since many diamond points share the load of wheel dressing rather than one diamond point. Second, although each individual diamond particle in the tool or cutter may have different characteristics, the average dressing action of the many diamond points is reproducible from cutter to cutter or tool to tool. These two considerations are of great importance for the successful development of automatic machines. Further, it will increase the use of natural mined industrial diamonds in relatively small grit or powder form sizes. It will replace in many dressing operations single tool types of good quality diamonds of larger size, now in demand, and which are now difficult to obtain even at increased prices.

Finally, it is assumed man-made diamonds or other "super hard" materials will first be offered for sale in the form of fine particle sizes. Thus, CDP products, in their present form, will be able to use man made diamonds or other "super hard" materials when they are released for sale. The Metallurgical Products Department of General Electric Company has announced that in due course they expect to provide a reliable domestic supply. • • •

Form Grinding Development

Continued

plus or minus a thousandth. On angles, about 10°.

Q: What kind of finish is obtained with the CDP cutter?

A: We'll stick in this discussion to resinoid and vitrified wheels, and when you speak of finish you must remember it's not so much dependent on the wheel as the means of dressing it. So far we've not been able to get better than 30 rms.

Q: How does this compare with a single point dressed wheel?

A: Well, with a single point diamond dressed wheel you can get just about anything you want by sawing a diamond down, letting it dull up a bit, broaden the point out and by other tricks of the trade. Right now we're grinding ball races down to 5 rms, which you can do with a single diamond. We couldn't do it by this process, at least not yet. Thirty is about as good as we've been able to do.

Q: What are the limits on the cutter?

A: About 5¼-in. The diameter of the roll averages about 2-¾-in. However, you can put gangs of them on an arbor, like milling cutters, and dress more than one wheel.

Q: How deep is it economically possible to form a wheel?

A: We've gone down ¼-inch. There's no limitation that I know of.

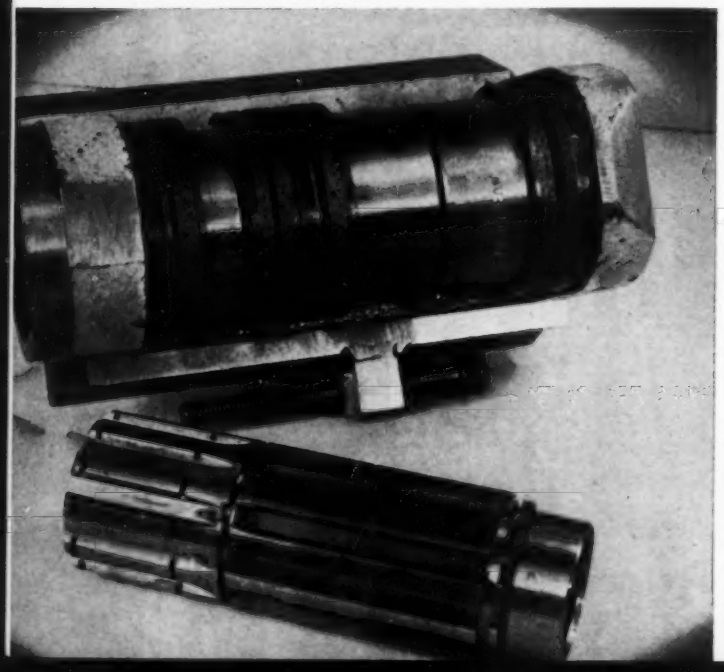
Q: Have you made any studies as to the size of the production run which is needed to warrant a cutter like this?

A: We're dealing right now with the automotive industry, also the aircraft industry. It's almost a must on automation. We don't know. We haven't gathered enough facts yet.

Q: So far we've discussed only form grinding. Can it be used on straight cylindrical work?

A: Yes, by using merely a round CDP cylinder.

Q: Is there a relationship between the diameter of the roll and diameter of the wheel?



A: Not yet. We've picked 2-¾-in. as fitting our particular dressing. This runs a wheel down from 24-in. to 14-in. You can take pretty deep cuts with this method of dressing the wheel. The grinding wheel is always corrected to the proper form. The last pass is taken at the same accuracy as the first, and you never add dressing time to grinding. A third of your floor-to-floor time may be wheel dressing with conventional methods.

Oil Still Best Coolant

Q: What about the coolant on this method?

A: It must be carefully controlled. We've found oil to be still the best on most form grinding operations. Special nozzles direct coolant to the grinding operation at high pressure.

Q: At what P.S.I. would you say?

A: About 25 P.S.I. Also, the coolant keeps the wheels clean. We think the oil penetrates the wheel and is carried to the cutter.

Q: Will this CDP-PFC method be standard equipment on all J & L machines?

A: No. It will have to be ordered if the customer wants it.

Q: What about existing J & J machines?

A: It can be installed on some older models; on others it cannot be done.

Q: Can a prospective user contact the Koebel people and purchase one of these cutters?

A: I do not want to speak for the Koebel people who've worked with us for the last five years in putting this across.*

Q: Then a man who had a competitor's form grinder couldn't use this development?

A: I don't want to say that. You can't withhold a new development from the industry. It's really a sales policy and I don't want to speak for the sales people. But we must remember that we build form grinders and that we would like to sell machines. If we can offer a customer something extra and helpful we will be happy. After all, the development originated with the idea of making J & L grinders even more versatile; it was not an idea to get into the diamond business or the cutter business.

Q: Thank you Mr. Flanders, for your time and allowing Grinding and Finishing *to present your thinking on CDP-PFC.* • • •

*We asked Mr. Charles J. Koebel the same question. He replied that his company was working with J & L as far as adapting CDP-PFC to new machines was concerned.

ON ANOTHER TRANSMISSION PART, multiple CDP cutter does grooving. Four grooves are ground, ranging from .069 to .135-in. wide and from ⅛ to ¼-in. deep. Completed, the J&L Model E grinder on which it will be used will have fully automated parts handling.

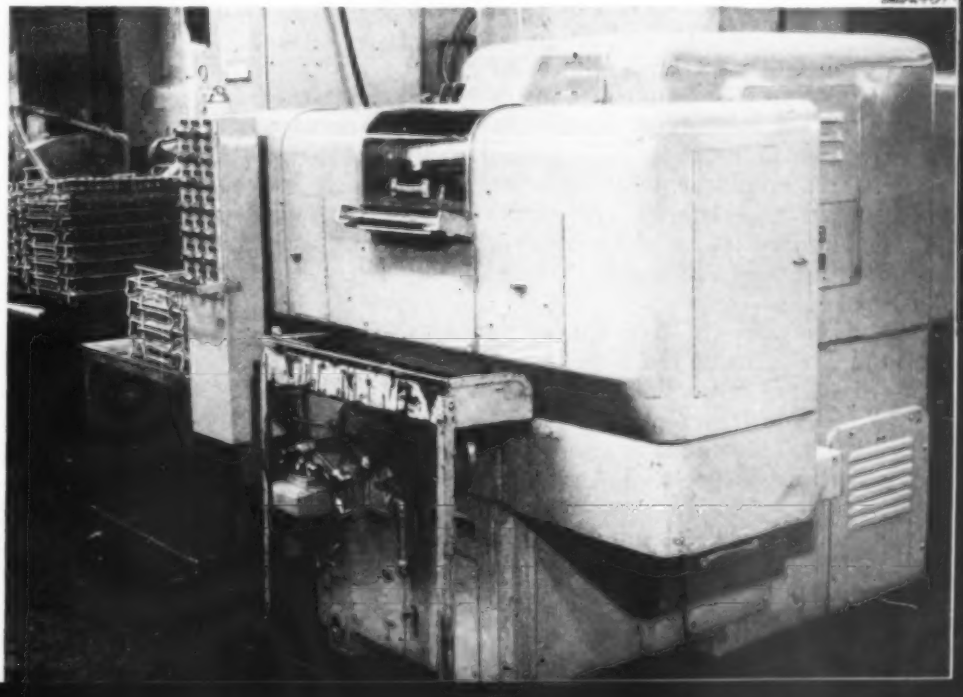
TWIN CONE-SHAPED CEMENTED DIAMOND cutters thin down both sides of this 20 x ⅜ x 10 grinding wheel for plunge groove grinding operation on Dynaflow input shaft. Original pair of cutters have lasted through 300,000 shafts.

How Buick Uses CDP Tooling

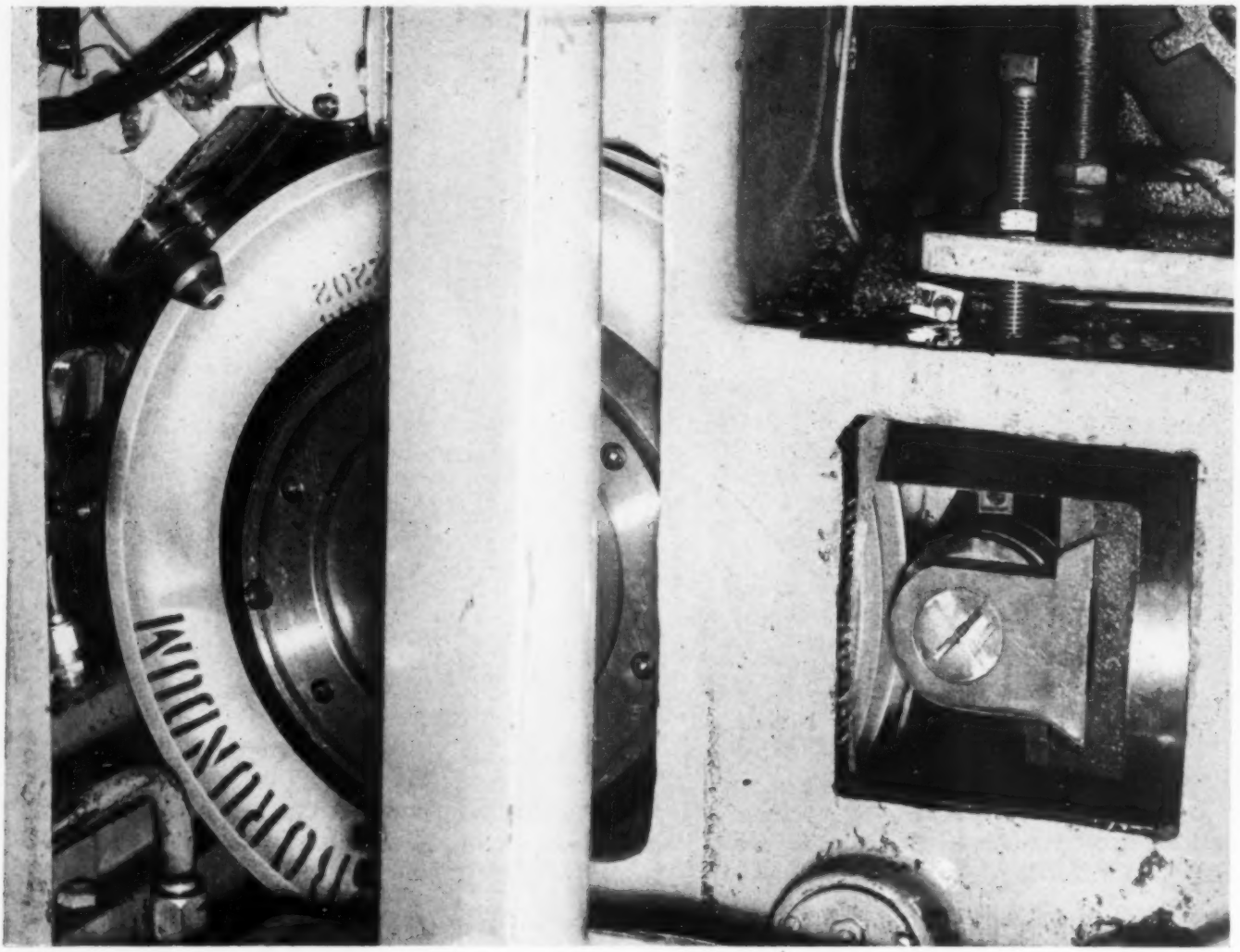
By **Jack Kenyon,** managing editor, as told by **K. B. Jackson,** assistant tool supervisor, Buick Motor Division.

● Buick Motor Division has been running a production grinding operation since October, 1955, using an early form of the Jones & Lamson-Koebel cutter dressing technique. The job involves grinding two narrow, accurately-formed grooves in the Dynaflow transmission input shaft. The two grooves, one of them cut into a splined section, are plunge-ground simultaneously on the hardened SAE 5145 shaft on a twin-wheel J & L Model E automatic form grinder. A combination of crush dressing and cemented diamond particle (CDP) cutter dressing generate the proper form in the two 20 x ⅜ x 10 grinding wheels.

In the Buick job, two power



J&L MODEL E form grinder cuts two grooves in input shaft, using combination of CDP cutter dressing and conventional crush dressing to maintain precise groove form.



BOTH CDP CUTTERS AND CRUSH ROLL are visible in this view of Buick's twin-wheel grinder. Cutters, upper left, are advanced manually to thin the wheel once per shift, while crush roll, lower right, goes into action as a machine cycle function once every 30th piece to maintain wheel face form. Cone-shaped cutters are mounted on indexing plate.

Buick's CDP Tooling

Continued

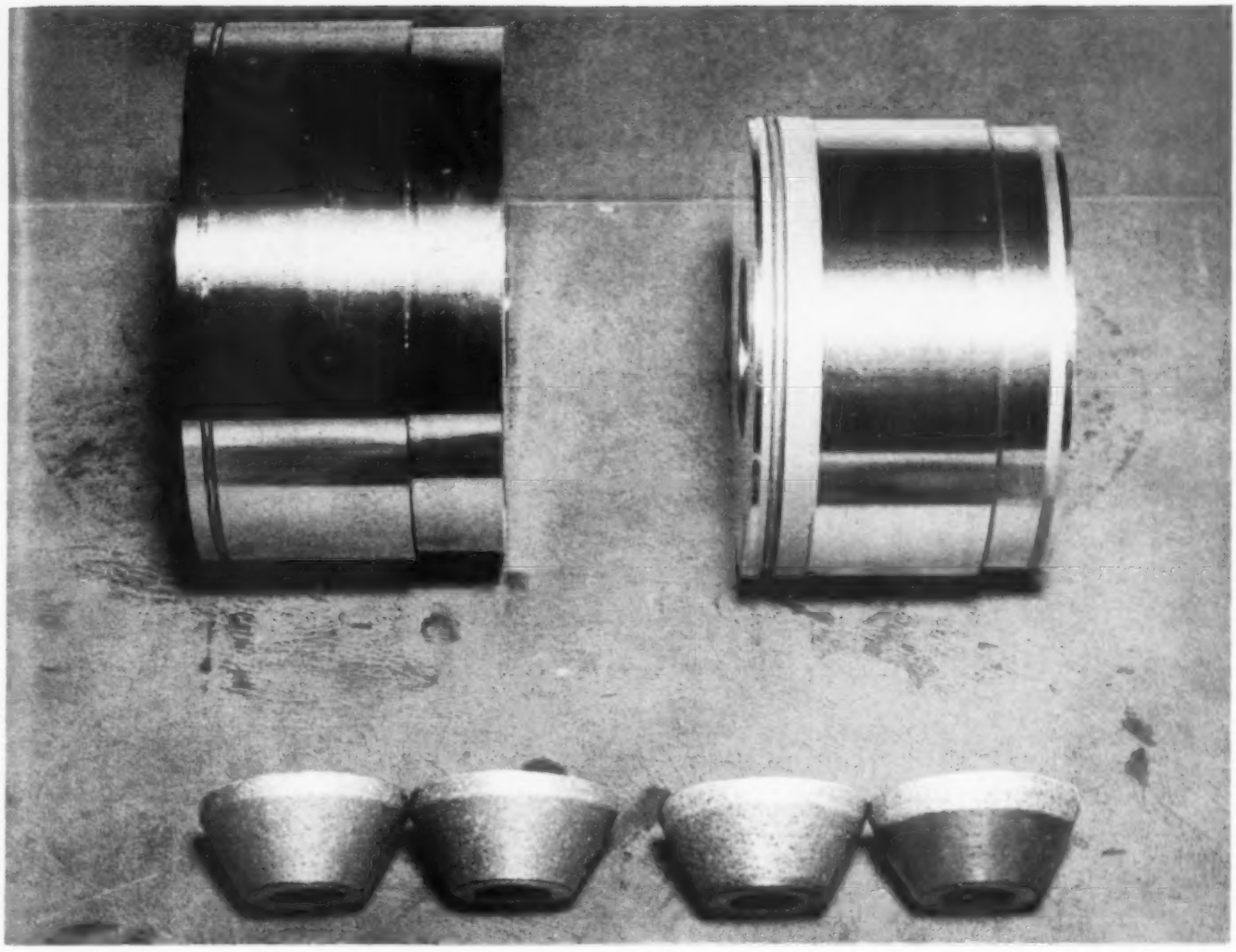
driven cone-shaped CDP cutters straddle one of the machine's two wheels to thin down both sides of the wheel. Each CDP cutter has an overall diameter of 1⅝ inches and length of ⅝ inch, with a 30° angle cone. The cutters are motor-driven on half-inch diameter spindles which point radially toward the center of the grinding wheel spindle. The sintered layer of diamond particles on the surface of the cone is approximately 1/16 inch thick.

After one wheel is thinned by the CDP cutters, the faces of both wheels are crush dressed, using a conventional hardened steel crushing roll. Thinning is necessary only about one in 24 hours. It is done by the machine operator while the grinding wheel is at full grinding rpm. Infeed of the cutters is done with a hand wheel. Crush dressing of the wheel faces, on the other hand, is necessary as part of the automatic machine cycle once every 30 pieces. For crush dressing, the grinding wheel slows to a normal crushing speed of about 35 rpm for a 45-second dressing cycle. It is conceivable that both phases of the dressing operation—thinning and face forming—could be handled by a single CDP cutter of the new type.

Highly Productive

The cemented diamond particle dressing cutters have stood up well in production, according to Buick engineers. The original pair of cutters have turned out nearly 300,000 pieces without appreciable cutter wear and with no attention except a routine size control adjustment. Peripheral wear of the dressing cutters, although very slight, is compensated for by having the cutter spindles mounted on an indexing plate. The peripheral wear causes widening of the gap between the cutters and results in widening of the groove in the part. When the upper size limit of the groove is approached, the plate is indexed to narrow the effective gap between cutters.

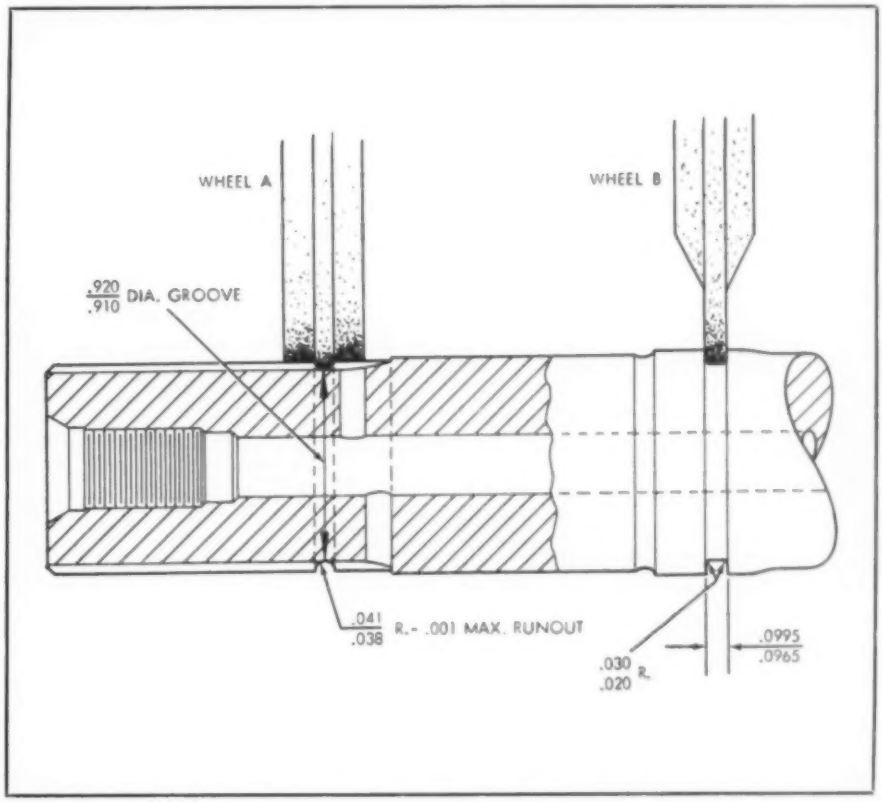
Limits on width of the groove ground by the thinned wheel are .003-inch. The bottom corner radii are held to .030 - .020 inch. The operator checks groove size and spacing intermittently with tem-



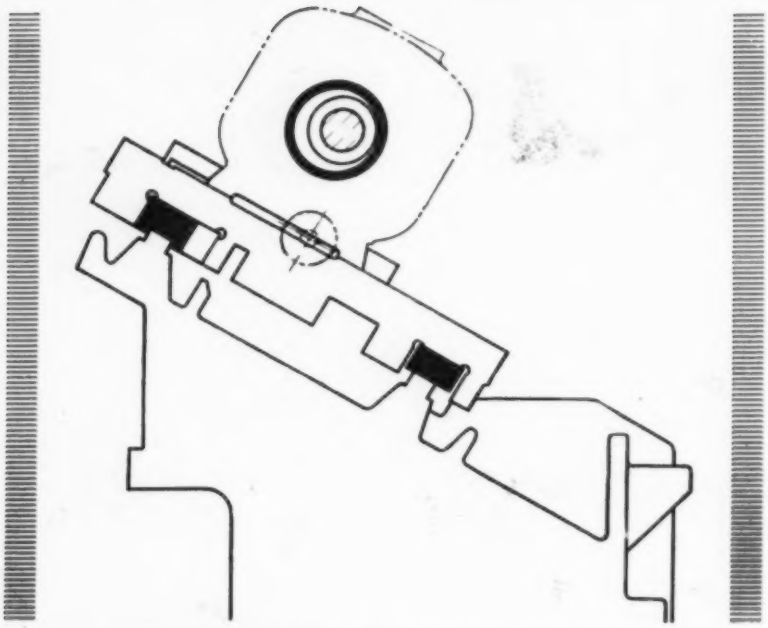
NEW AND USED cutters and crush rolls from the Buick installation. Reconditioned crush roll is installed at about same frequency as grinding wheel changes, while set of cutters, which thin wheel "B" in drawing, right, have lasted through year and a half of high production.

plate type gages. A Jones & Lamson optical comparator checks the piece part to show the amount of wear on the steel crushing roll. Crusher roll wear shows up in destruction of a semi-circular form on one of the wheels and in excessive corner radius on the other.

Vitrified grinding wheels used on the groove-grinding job carry the specification AA80 K VT, type 1. Crush rolls are changed about as often as grinding wheels—approximately every three weeks in normal production. The wheel operates at 2150 rpm, and thread grinding oil is used as coolant. Automatic part loading and unloading by means of a magazine-type rack are features of the machine. • • •



WHEEL "A" GRINDS semi-circular groove in splined section of shaft. Wheel "B", thinned by CDP cutters, works to limits of .003-in. in groove width.



30-DEGREE INCLINED TABLE, box type ways and relation of wheel and wheelhead to work in new internal grinder.

New Angle in Internal Grinding

Cuts Cycle Time Up To 50%

- ✓ *grinding stays buried in wheel without chatter or bounce*
- ✓ *mounting wheelhead table at an angle provides greater strength and rigidity*
- ✓ *remove stock at rate of 2 cubic inches per minute while roughing in*
- ✓ *3¼-in. OD bearing races have been run with a cycle time of 17 seconds per piece, compared to a previous time of 32 seconds.*

Special to GRINDING & FINISHING

● A new approach to basic principles of internal grinding has been developed by The Heald Machine Company. The idea: Mount grinders on ways, with the wheelhead table inclined at an angle of 30 degrees toward the work to resist the forces of grinding. The result: Solid wheel backup to take heavy wheel pressure, true tracking of table, better drainage for coolant and better base for mounting wheelheads.

The radically new design has cut over-all cycle time by up to 50 per cent on work in the upper size ranges in both straight and taper bore grinding and in ball track grinding on work up to 3¾-in. OD. The increase in production speed has been achieved with no sacrifice in accuracy, precision or surface finish of the work, according to the company.

Principle into Practice

The inclined table design is featured in two new Heald "Rite-Angle" Centri-Matics—Model 190A for straight and taper boring, Model 1901A for ball track grinding.* Both are fully automatic ma-

* *Capacities for Model 190A are: Max. OD of work: 4½-in.; max. length of work, 1½-in. (with special chute, 2-in.); min. dia. of hole that can be ground, ⅜-in.; max. included angle of taper (Size-Matic only), 60°; center*

chines for small to medium work (up to 4½ in. OD.) requiring precision internal size and finish—anti-friction bearings, retainer rings, gear blanks, refrigerator compressor rolls, spacers, bushings and similar parts.

In operation, work is located and rotated on its own periphery against hard shoes and clamped against a rotating backing plate. This Centri-Matic workholding method is said to maintain the advantages of centerless grinding while tending to bridge any waves present in the OD. Thus perfect concentricity is produced between ground bore and OD while reducing the possibility of repeating waves in the bore or raceway.

The "Rite-Angle" construction enables the grinding wheel to stay buried in the work without chatter or bounce. A wheel that bounces from an unstable condition or one that chatters will load, refuse to cut and burn the work.

Precise calculation established the optimum table angle in terms of mass, friction and reciprocation of the mass, to counteract the resultant of feeding and grinding forces acting on the table.

Experiments showed mounting the wheelhead table at an angle provided greater strength and rigidity, permitted much heavier stock removal on the semi-finish grind and utilized the full available power of the wheelhead.

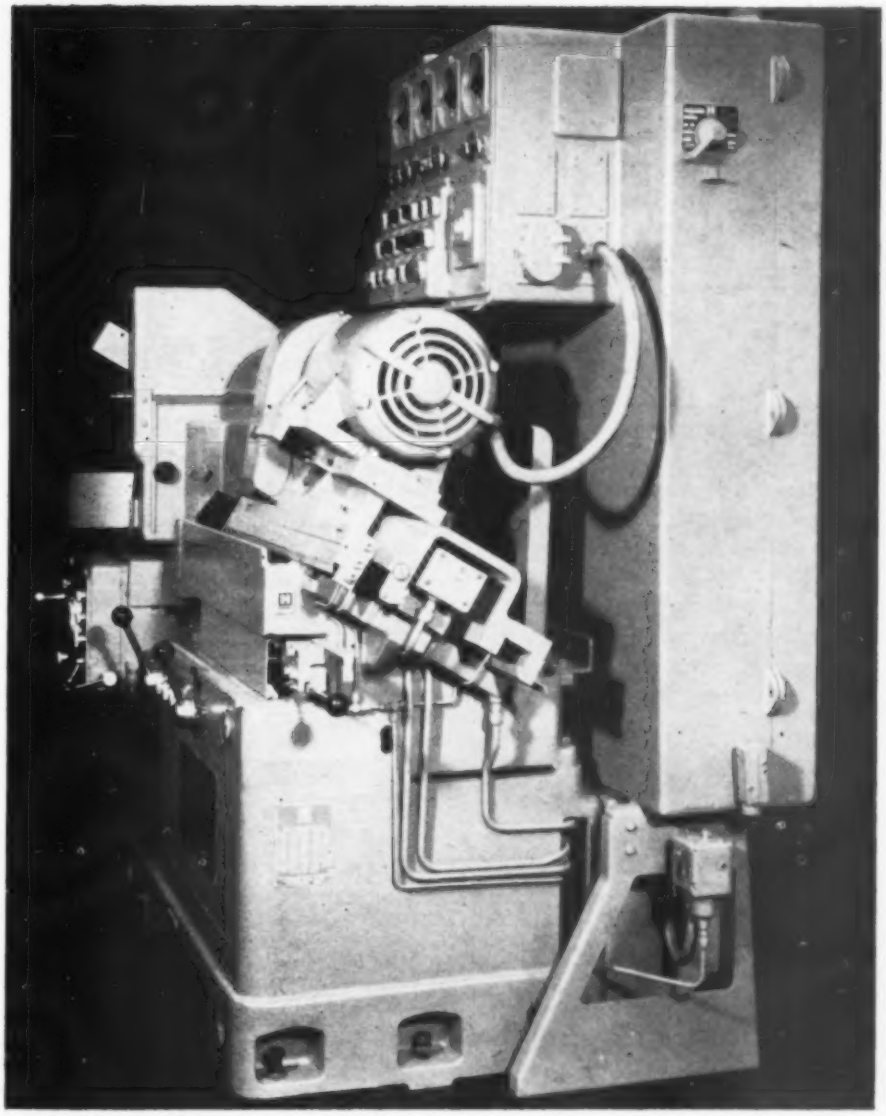
On a test machine, engineers overloaded a 10 h.p. motor to 15 h.p. at peakload before reaching the limitation of the wheel. They also calculated it would now be possible to remove stock at a rate of 2 cubic inches per minute while roughing in, double the previous rate, on jobs where the wheel and wheelhead are of a size to take a heavy cut.

Test Results Spectacular

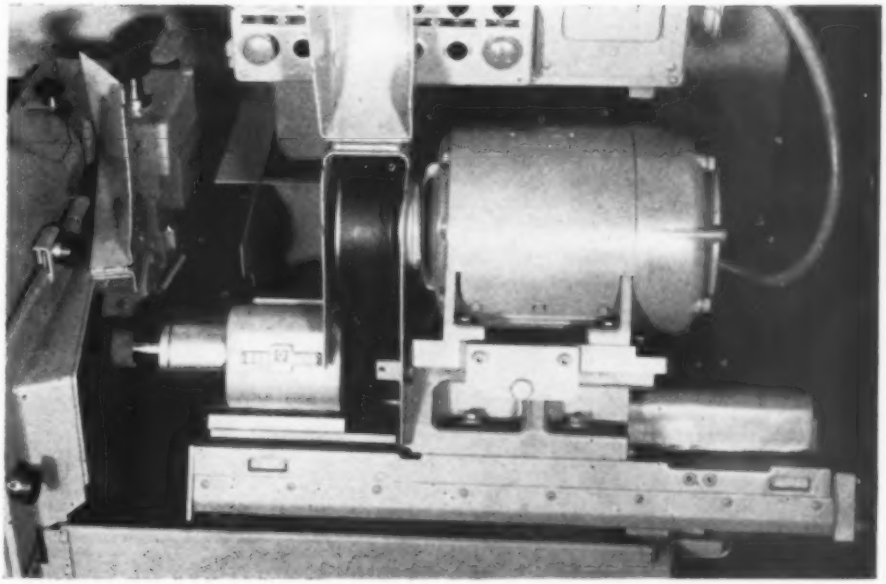
After theories were found to be fact, they were incorporated into machines. Since production economies obtained depend upon the amount of stock removed, the larger

of wheel spindle from floor, 40-in.

Capacities for Model 1901A are: Max OD of work, 4½-in.; max. work length, 1½-in. (with special chutes, 2-in.); min. dia. of hole which can be ground, 5/16-in.; center of wheel spindle from floor, 40-in.



INCLINED CONSTRUCTION allows swarf and coolant to drain off the table and directly into the coolant tank without coming in contact with table ways.



CLOSEUP WITH GUARD OPEN illustrates arrangement of belt drive to wheelhead. Hi-frequency drive can also be used.

Angle construction allows clearance for diamond dressing units. Head heights can be easily adjusted.

work sizes show the most spectacular improvement.

For example, 3¼-in. OD bearing races have been run consistently with a total cycle time of 17 seconds per piece, compared with a 32-second cycle on the same work obtainable with present equipment. For smaller size work, time savings per piece are somewhat less, but total time cycles are also shorter.

A design bonus of the inclined table construction: Combining the strength and rigidity of box-type ways with vee-way accuracy of alignment. Because the guide is nearly up to the centerline of the wheelhead, thrust forces against the wheelhead and table for heavy grinding are against the lower side of the gib or into a horizontal vee way. The lower way is simply a flat guide to keep the table straight. The angle also allows clearance for various diamond dressing units and use of either belt-driven or hi-frequency wheelheads.

The wheelhead mounting arrangement provides a simple adjustment for head height. By moving the head at right angles to the axis of the table—with a tapered gib on one head clamp—the spindle is raised or lowered on the inclined table to compensate for any height differences when changing heads. Moving the gib 2 increments moves the centerline of wheelhead exactly 1 increment providing quick, easy adjustment of the wheel precisely to the center line of the work.

"RITE ANGLE" TABLE CONSTRUCTION, which combines strength and rigidity of box type ways with vee-way accuracy of alignment. This machine is equipped with Hi-frequency wheelhead.

Swarf and Coolant Disposal

With the table inclined, swarf and coolant drain off the table and directly into the coolant tank. As the table ways and hydraulic cylinder are well above the coolant and flow level, there's no possibility of fouling the way lubrication or contaminating the hydraulic fluid with grinding residues and coolant.

The table cylinder and piston can be attached to the table close to the center line, ideal for providing a straight push to the table. The table-dog operating lever is attached to the table between the ways. This keeps all reciprocating and control forces in line with the table motion, as well as making the reverse point inside the ways.

Spindle pressure against the work during all portions of the grinding cycle is measured by an ammeter installed on the machine. After the optimum pressures during roughing and finishing stages are established during the set-up period, feed box controls are set to maintain these pressures automatically during the production cycle. • • •

Surface Grinding

HORIZONTAL SPINDLE—RECIPROCATING TABLE

Part 3: Machines, Attachments, Set-Ups

EDITOR'S NOTE:
While this article is devoted to machines, attachments, and set-ups, no attempt is made in a survey of this type to cover all of the many available attachments, particularly the infinite variety of dressing tools and devices available to speed surface grinding operations. Dressing tools in particular will be treated in detail in a further article to appear at the end of this present series.

● In the past decade, surface grinding has definitely come of age as a production process which virtually puts tool-room precision on a high production basis. Probably the most numerous of surface grinders are those with horizontal spindle and reciprocating table.

All kinds of plane surface grinding can be done on them with great accuracy and a good finish with a straight scratch pattern. Slots and grooves of all types are a busy number of these machines, for the scratch pattern is excellent for sliding bearings.

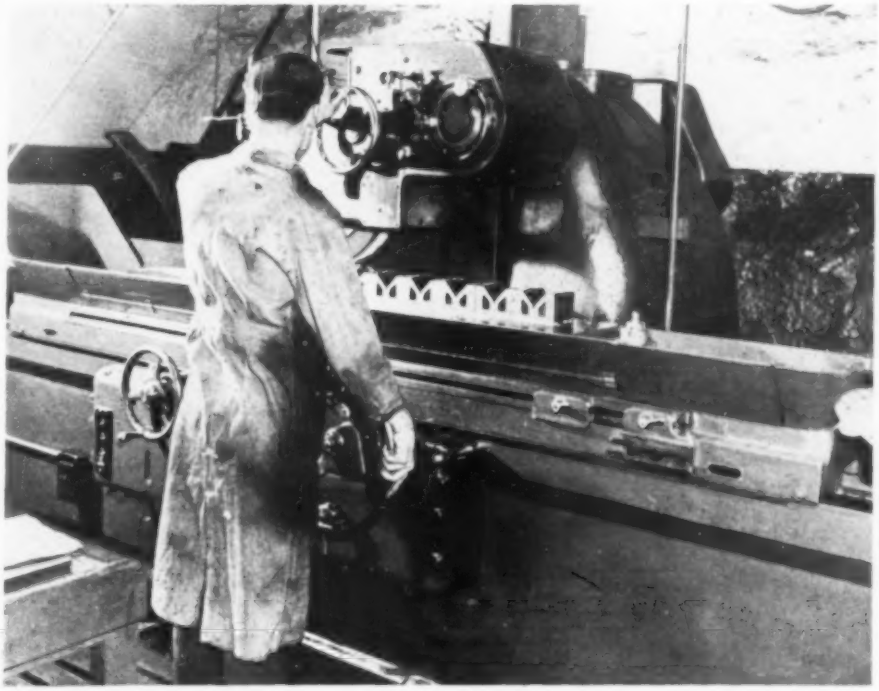
Tolerances of .0002" for dimension, straightness, and parallel are common in high production work. The grinding action is cooler than that of some other types, and they can handle both large and small surfaces.

With a variety of attachments, work holding devices, and special rigs, they can do an infinite variety of form grinding jobs rapidly and accurately.

Characteristics:

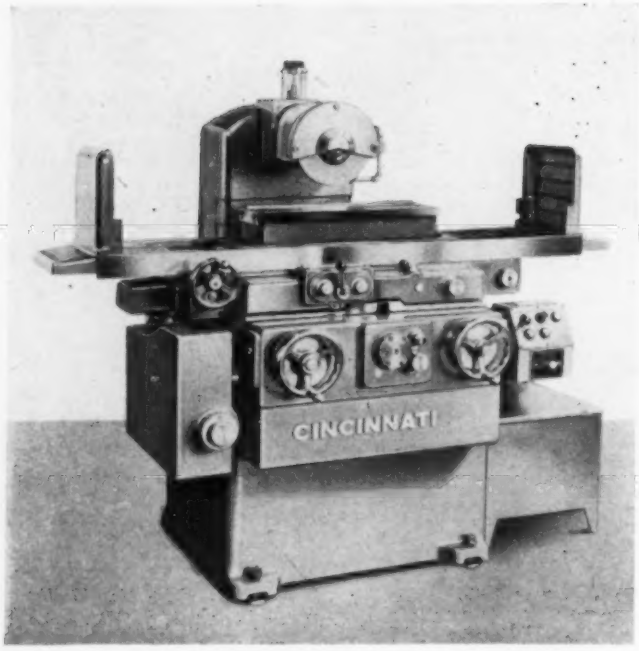
Among the essential characteris-

RECIPROCATING TABLE surface grinder has tilting wheel head, as shown in this and illustration below. In this photo, wheelhead is in conventional position for grinding, using magnetic chuck. A simple adjustment of the spindle block makes possible many operations which ordinarily require special set-ups. In some cases it is possible to finish the surfaces of slots, dovetails, and undercuts with the angular face or periphery of the wheel, rather than the side, thus saving time and wheel-wear in dressing.



HORIZONTAL SPINDLE surface grinder with very long bed and reciprocating table uses a large magnetic chuck to hold several pieces of work and grind them to the required dimension in one operation. In this particular set-up, the operator is achieving required dimension and finish in a series of passes, lowering the wheel a few thousandths with each pass.

GRINDING TO A SHARP CORNER on a difficult shoulder with wheelhead tilted is greatly amplified by use of the tilting wheelhead on the surface grinder. The tilting wheelhead swings in a vertical plane about the center of the wheel. The spindle is carried in a cast-iron block mounted between two pairs of circular dovetail slides. Taft-Peirce No. 1 Precision Surface Grinder.

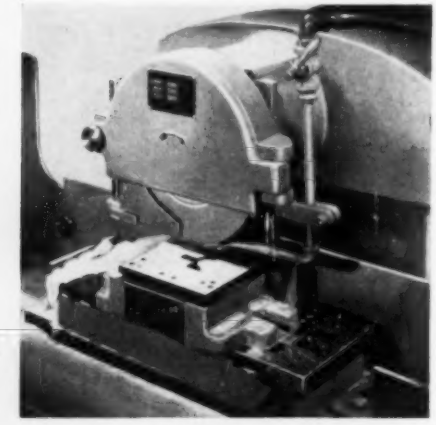


DESIGNED TO SUIT exacting requirements of toolmakers, the Cincinnati Filmatic No. 2 Surface Grinder is also built to stand up under production loads, according to the manufacturer. Special features include integral spindle housing and carrier cast as a single unit, infinitely variable table speeds to 100 f.p.m., table stroke controlled by dial settings, and a wide range of accessory equipment.

HAND FEED precision surface grinder, No. 618, produced by Abrasive Equipment Company, is available with several attachments, including magnetic chucks and other work holding devices, indexing centers, radius and angular truing apparatus, as well as built-in features such as ease of maintenance and adjustment. Also available are dust collecting and wet grinding attachments.

tics of a modern high-production surface grinder are: extreme rigidity of construction, heavy duty spindles and bearings, frame and housing of heavy construction, and table with work holding devices which will hold the work true in its relationship to the wheel.

Extreme rigidity and freedom from vibration are essential in surface grinders which are expected to deliver consistent dimensions to close tolerances, with the required degree of fineness of finish. This is particularly true in long runs where parts are being formed which will be used interchangeably by the customer.



SET UP for grinding blanking die without removing inserts from die set, using wet grinding attachment and magnetic chuck.

Similarly, spindles and bearings must be rugged enough to withstand far more than normal working pressures, particularly where they are used in form grinding with wheels formed by crush rolls, which exert heavy lateral pressures on wheel spindles. Any slope or endplay in these shafts produces work which will not pass inspection.

Tables must, of course, be heavy enough to hold their position so that work will remain true in its relationship to the grinding surface of the wheel and be correctly formed to the required dimension. Table ways and bearings must be of quality which will permit long use with minimum maintenance under high production operating conditions.

Wheel movements

Most modern surface grinders provide not only horizontal traverse but downfeed controlled either by hand with micrometer adjustment or by automatic adjustments which make it possible for the downfeed to be made automatically to the required depth either in one pass or in repeated traverses of the work table.

Automatic downfeeds provide for downfeed in increments of depth ranging from .002 to .080 with stop switches which halt the downfeed at the appropriate depth.

Table Movements

Table speeds as high as 100 f.p.m. are attainable on certain machines, with calibrated adjustments permitting extremely slow speeds for work requiring such traverse. Some tables are equipped with preset slow traverse and rapid return to keep production moving rapidly. Tables with automatic downfeed and rapid return may also be equipped with an automatic feature which raises the wheel a few thousandths to provide clearance for table return.

Some tables are equipped with a skip-feed device which enables a number of small pieces to be ground simultaneously, spaced apart by blocks, with fast table movement between pieces and the required slower movement during the actual grinding action.

Chucking

The magnetic chuck is one of

the most valuable and convenient labor-saving devices in the metal working industry. Its chief advantage lies in the fact that it can be used as a permanent fixture, handling a great variety of work without resetting or changing, thereby eliminating lost time otherwise used in repeated clamping.

There are two types of magnetic chucks, the electromagnetic and the permanent magnet type. Electromagnetic chucks derive their power from direct current, whereas permanent magnets supply the holding power for permanent magnet chucks.

Holding power of magnetic chucks depends not only on the pull of the chuck itself, but also on the size, shape and material of the work, and the amount of surface in contact with the chuck. If the piece is small in section, the hold will be very light, since it is limited by the number of magnetic lines of force which can be passed through the section.

For very heavy cuts, end stops should be used. The smoother the surface which is in contact with the face plate, the better is the holding quality.

In grinding very thin work on electromagnetic chucks, it will often be found helpful to place the work on the chuck plate, close the circuit, and then promptly open the circuit without demagnetizing the plate. The residual magnetism will frequently be sufficient to hold the work. Only light cuts should be taken, turning the work over after each pass, alternate sides being ground successively until the "spring" is taken out of the work.

Attachments

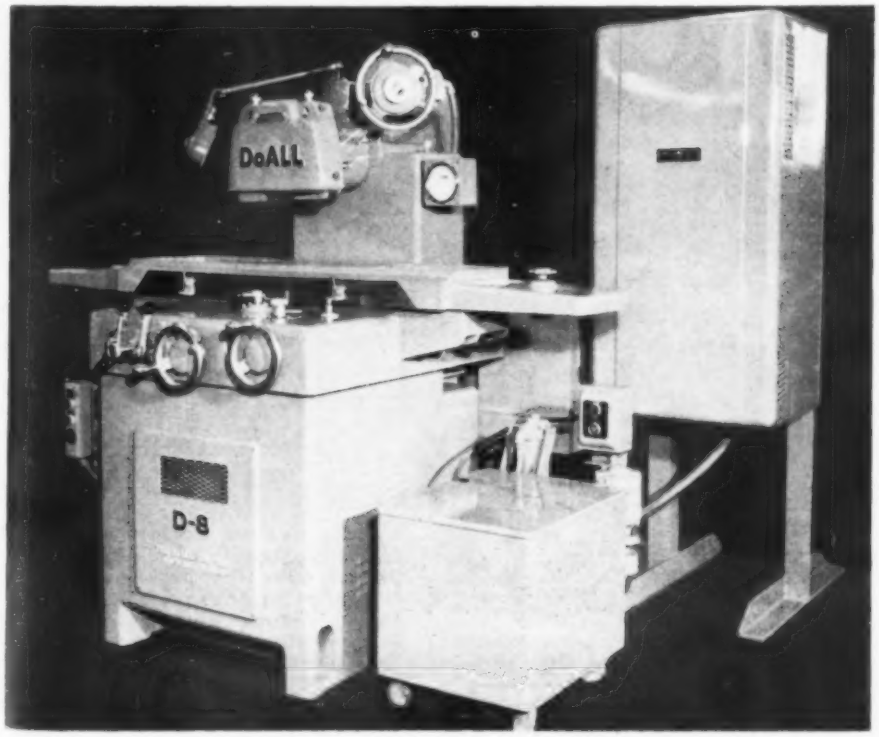
Having once set up the essentials for good surface grinding—a wheel well mounted on heavy duty spindle held in a rigid housing, with suitable reciprocating work table and magnetic chuck held in the proper true relationship to the wheel—we can now consider a variety of attachments and special devices which are designed to add to the economy, ease, and precision of operation of the surface grinder.

At least one grinder comes equipped with a tilting wheel shaft which permits the edge of the standard wheel to be used in narrow grooves and tight shoulder corners which otherwise require a formed wheel.

Wet grinding attachments are of various kinds, principally consisting either of hose and nozzle attachments to flood the area of contact between wheel and work, or of

WET GRINDING the face of the magnetic chuck to insure its flatness and cleanness when work is placed in position. Any bumps or ripples in the chuck surface will cause work to be out of dimension or possibly of poor finish.

WET GRINDING die component using set-up blocks to position the work accurately. It has been found that dry surface grinding requires softer wheels than may be used for wet grinding.



ACCORDING to the manufacturer, there is no need to remove work for measurement after each pass where close tolerances are being held. Work may be measured only once, after which the calibrations of the vertical feed handwheel may be relied upon to control the exact amount of stock removal.

devices which feed coolant or lubricant into the center of the wheel and rely on centrifugal force plus wheel porosity to carry the fluid to the wheel's surface. In certain situations both methods are used at once.

Dust collecting devices are of various types, some being adjustable depending on size of wheel used etc. A wide range of shields and guards are also available, wheel guards being both metal or clear plastic. Individual lighting fixtures are also available for some machines to enable the operator either to see the work or to observe the finish.

Sine chucks and angle chucks exist in a number of varieties to be used either alone or in conjunction with magnetic chucks for special positioning of the work. Along with these are a wide variety of special angle blocks, V-blocks, sine blocks and similar pieces useful in myriad set-ups.

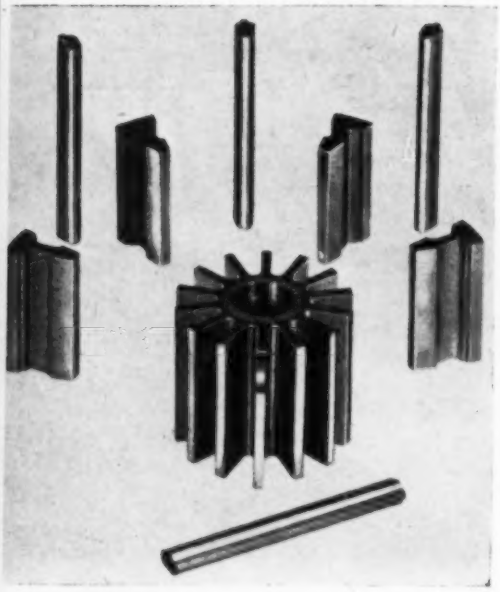
Similarly, several manufacturers offer centers which can be mounted on the magnetic chuck for holding certain types of work. Some of these centers are motorized, and provide an indexing feature useful in grinding parts with serrations or blades or ridges arranged longitudinally around the core of the piece.

Crush roll devices are provided which may be used either on the chuck or permanently mounted at the end of the table so that a slight additional traverse brings the roll into position to dress the wheel. Such rolls may be idler rolls or may be independently motor driven, to operate when the grinding wheel is idling.

Permanently mounted dressing tools come in a wide variety of types, chief among them being the standard dressing tool permanently mounted above the wheel, the diamond point tool mounted behind the wheel, and any one of several forms of diamond point plus template arrangement which makes it simple for the operator to dress the formed wheel according to the desired profile. Some of these latter incorporate a pantograph feature in which the template is oversize with a ratio of 3 to 1 or more so that even greater accuracy in guiding the diamond dressing point is achieved.

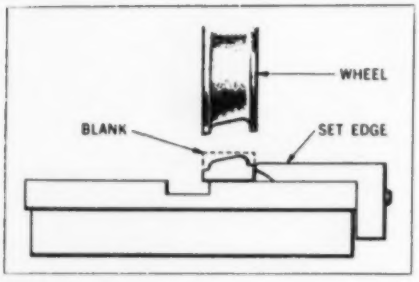
Safety Factors

In addition to extreme rigidity and careful guarding, most modern surface grinders incorporate other safety elements designed to protect both the operator and the work. These include such governing controls as having the automatic and



PROBLEM:

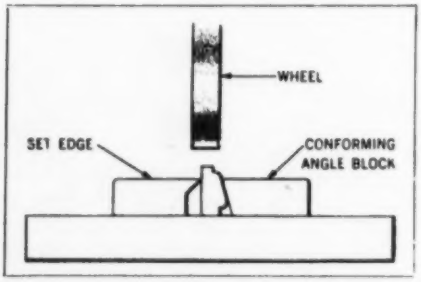
A TYPICAL EXAMPLE of linear form grinding cited by Richard F. Moore, of the Moore Special Tool Company, is the rotor piercing station of an all-ground lamination die, the problem being to grind accurately for interchangeability the punches and die sections shown.



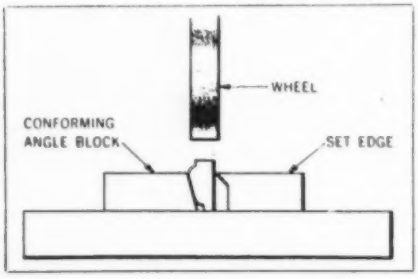
PUNCH SOLUTION:

THE PUNCH SECTIONS are form ground from rectangular hardened blanks, as follows:

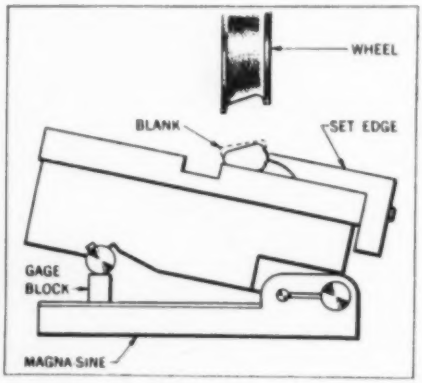
(a) The blank is mounted on a magnetic chuck, and the form is rough ground on one side. By using a smaller stylus than normal, the wheel can be dressed so that this rough form grinding leaves .002 for subsequent finish form grinding.



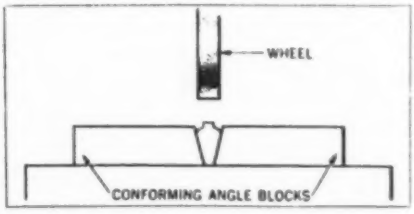
(b) The nose end of the blank is then ground clean, registering from the back and rough ground side.



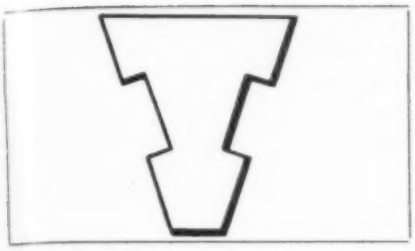
(c) The piece is reversed, and the back ground from the nose and rough ground side.



(d) Again mounted on the inclinable magnetic chuck, set at half the angle of the punch, the remaining side is rough form ground. At this stage the punch has .002 left all over.

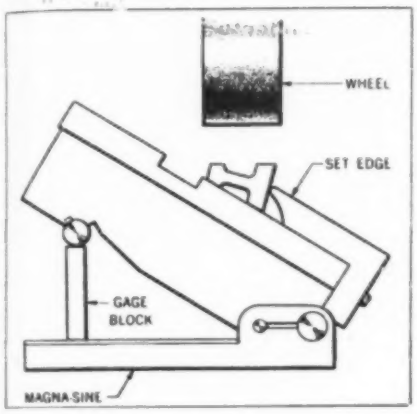


(e) Using normally corresponding diamond and stylus, the wheel is dressed to the finished form. The rough ground punch is then set up as above and finish form ground. The radii are measured optically in a projector and the overall dimensions are measured mechanically with a comparator. The tail is then ground to dimensions from the nose, thus completing the punch.



DIE SECTION SOLUTION:

(1) The die sections are form ground from hardened blanks as follows:



(2) Grind one side to the corect angle on the inclinable magnetic chuck.

hand feeds lock each other out when one or the other is used. Similarly, down feeds are provided with automatic cut-outs. Table and wheel traverses are held in check with limiting dogs or other stops.

Special applications

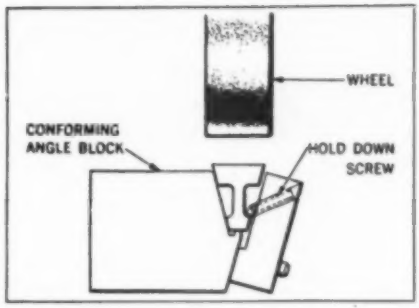
A number of special applications have found the basic surface grinding machine useful with nominal conversion as to work holding or feeding mechanism. In one instance, the basic grinder has been modified to be used as a slicer, cutting germanium and silicon wafers for the electronics industry.

In this application, the raw stock is held on the table and moved against the diamond wheel or blade. Following the table traverse and return, pre-indexed crossfeed of the wheel brings it into position for the next cut.

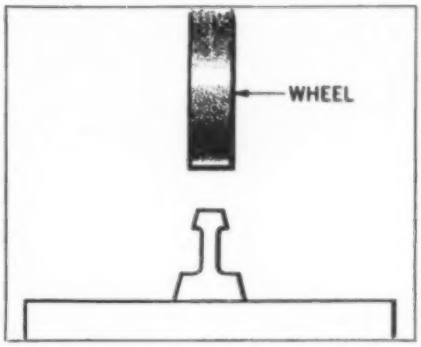
Economics

Profit and loss in surface grinding depend to a large degree upon the kind and amount of protection given the work as related to the time and skill of the operator. Hence, the more nearly automatic the machine, and the less time and skill required of the operator to insure quality work, the more economic surface grinding becomes.

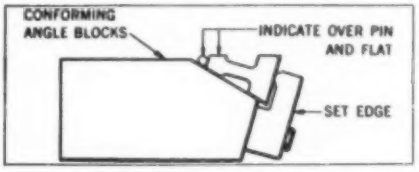
Essentially, this boils down to the



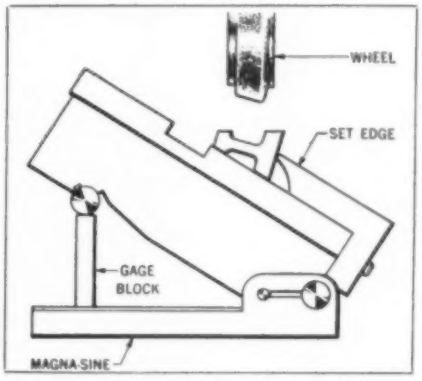
(3) Grind the back in proper angular relation to this side.



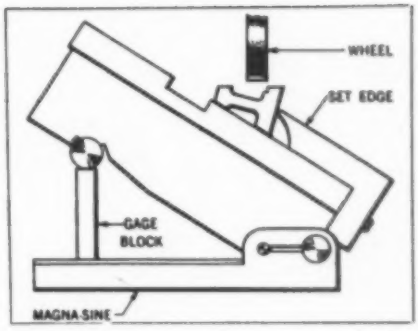
(4) The nose is ground from the back, leaving exactly .002 stock.



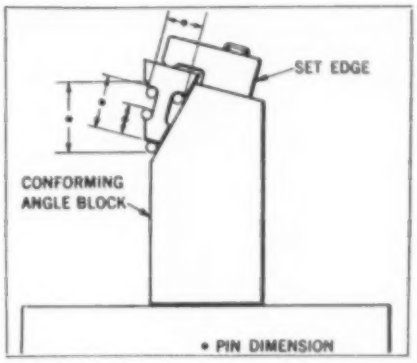
(5) Using the same set-up as before, grind second side, leaving .002 as measured at the nose. Check results in a fixture, using only one pin at nose.



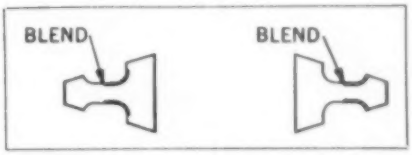
(6) The form, except for the step, is rough ground within .002 of size on both sides on the inclinable magnetic chuck set to the included angle of the part. This can be checked to a projected layout.



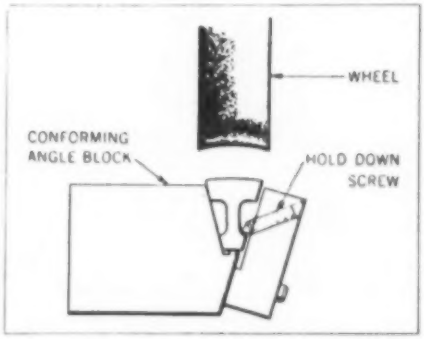
(7) The step is then rough ground in the same set-up, leaving the same stock allowance. The angles of the side are finish ground in the same set-up as in Step 1, (Fig. 2), working to a pin dimension checked in the fixture with an electric comparator. (See Fig. 5).



(8) Step is then finish ground, working to a pin dimension as shown. Finish grind the entire form, working to pin dimensions from the nose. Final inspection is made to measurement over and between pins after radii have been optically measured.

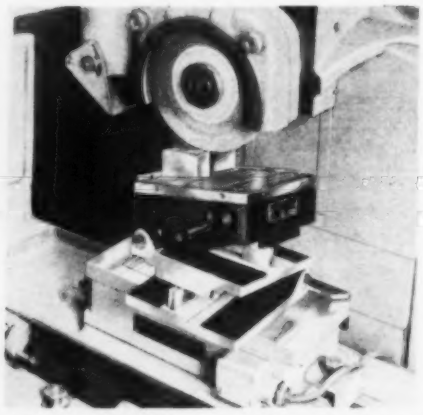


(9) The necessary draft is ground to within approximately 1/6" of the end on the inclinable chuck, packing the end of the piece up from the chuck and away from the set-edge to give the required taper. In practice, one half of the form is first draft-ground on each side of one section. The remaining half is then ground to a blend with the first. Draft is ground in the last step.



(10) The radius, conforming to that of the jig ground hole which it must fit, is ground on the back from a template and formed wheel.

AUTOMATIC DOWNFEED feature of this machine is controlled by a knob graduated in thousandths and half thousandths. It provides for automatic vertical feeds in increments from .002" to .080" at each table traverse. An adjustable limit switch stops the operation when the desired dimension is reached.



ELECTROMAGNETIC CHUCKS available to speed surface grinding operations include this Simple Sine Angle chuck, shown set up for grinding a simple angle on the work piece. A wide range of motions and positions may be achieved with this device so as to position the work correctly to the desired angle.

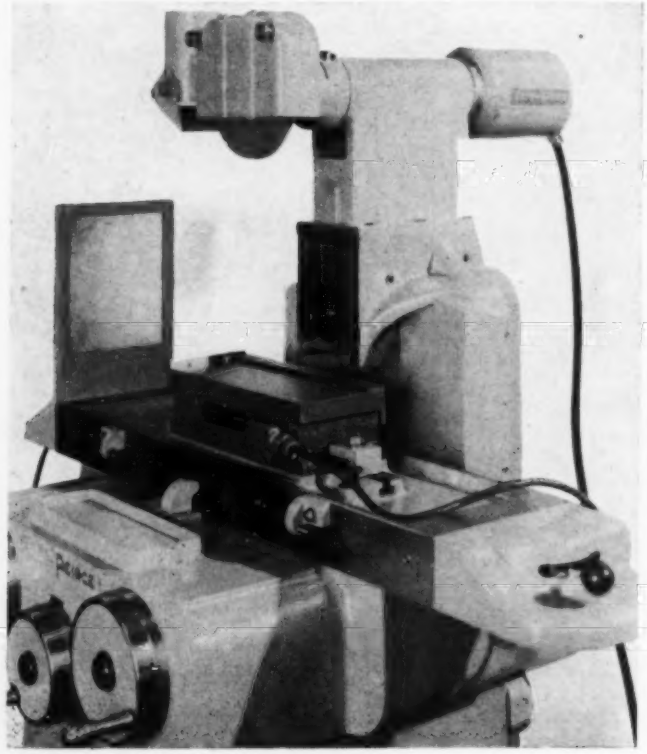
ANOTHER USEFUL ATTACHMENT for surface grinding is this automatic skip feed, which when combined with fast table traverse, makes high production jobs really high production. Simply stated, the device speeds up table traverse between work pieces which are form ground with slow table feed. Spacing controls the position at which rapid traverse occurs, and the length of the dog used controls the amount of rapid traverse.

basic elements mentioned above. Is the grinder sufficiently strong and rigid in design and construction to maintain proper relationship between the grinding wheel and the workpiece under the occasionally heavy pressures exerted? Does the grinder have sufficient strength to support an accurate system of screw and vernier feeds that will translate knob or wheel movements accurately into ten-thousandths of an inch in work dimension? Finally, does the grinder have an effective means of controlling the heat and stress generated in the work during grinding so that the internal character of the piece and its finish are both as desired when the work is completed?

Once having met these requirements, the modern surface grinder, with its myriad attachments and controls, becomes a versatile and useful machine for handling a virtually unlimited variety of work at a profit. • • •

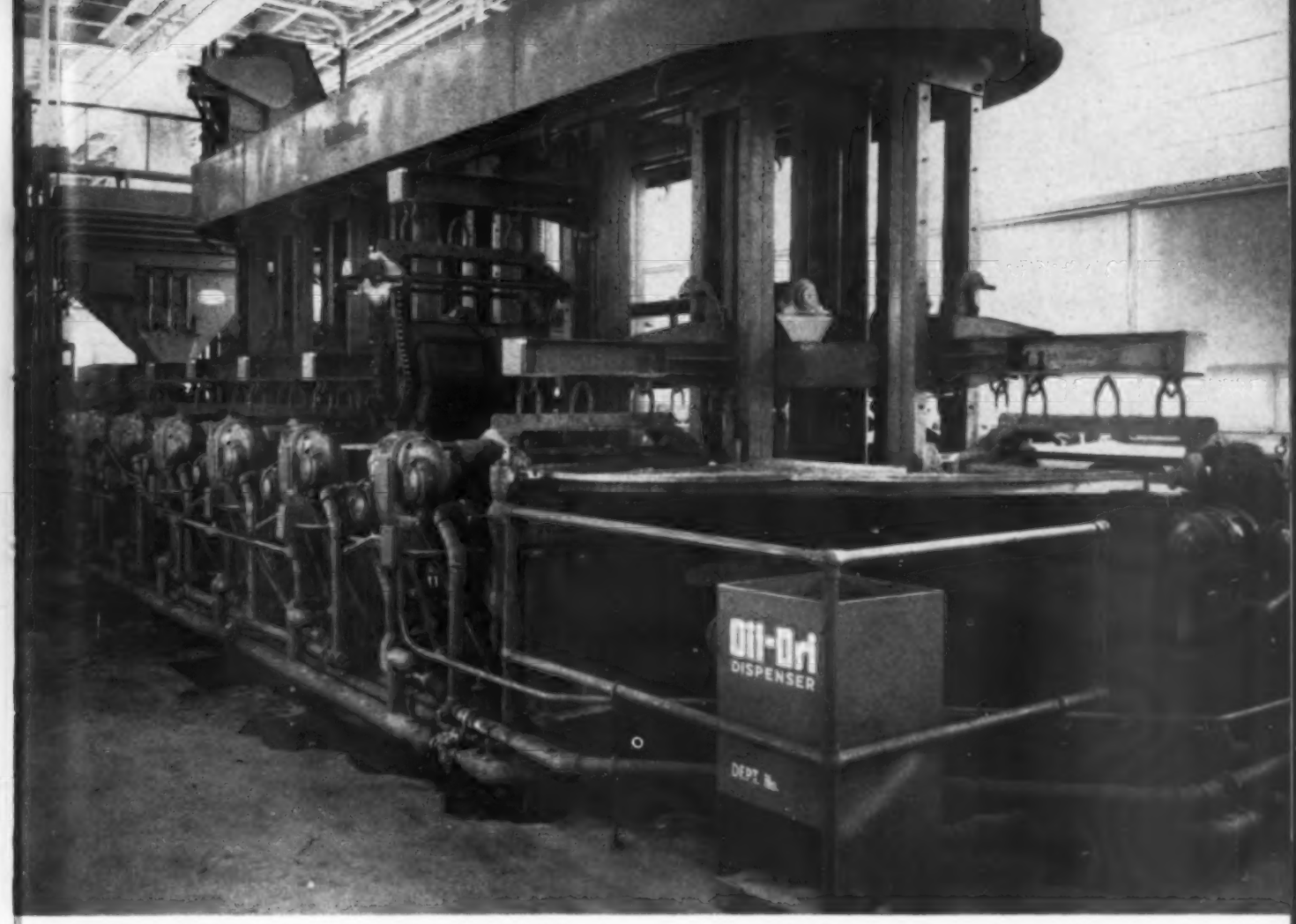
End of part 3.

Part 4 will appear in June.



PRECISION SURFACE GRINDER with horizontal spindle mounted on riser block which provides an added 12" clearance under the wheel for grinding oversize pieces. Special work-holding fixtures may be used in connection with the magnetic chuck to make such operations practical and accurate as to results.

FINISHING THE V-WAYS for a precision grinder, the work is held in a special indexing fixture so that V and flat ways are ground with the periphery of a standard grinding wheel. Considerable time is saved by the method, as no time is required for changing wheels, bevel dressing, etc. Surface of ways are finished parallel and flat to within .0002.



FIFTEEN BARRELS at a time are processed in Sub-O-Matic machine. In view above, all barrels are rotating in tanks except one which is skipping a tank in response to push-button program at operator's station. Barrels have perforated sides.

Automatic Barrel Finishing at IBM

Typewriter parts at IBM undergo cleaning, deburring, descaling, polishing and rust inhibiting in fully automatic submerged barrel finishing installation, at a large saving in time and labor.

by **Robert S. McFall,**

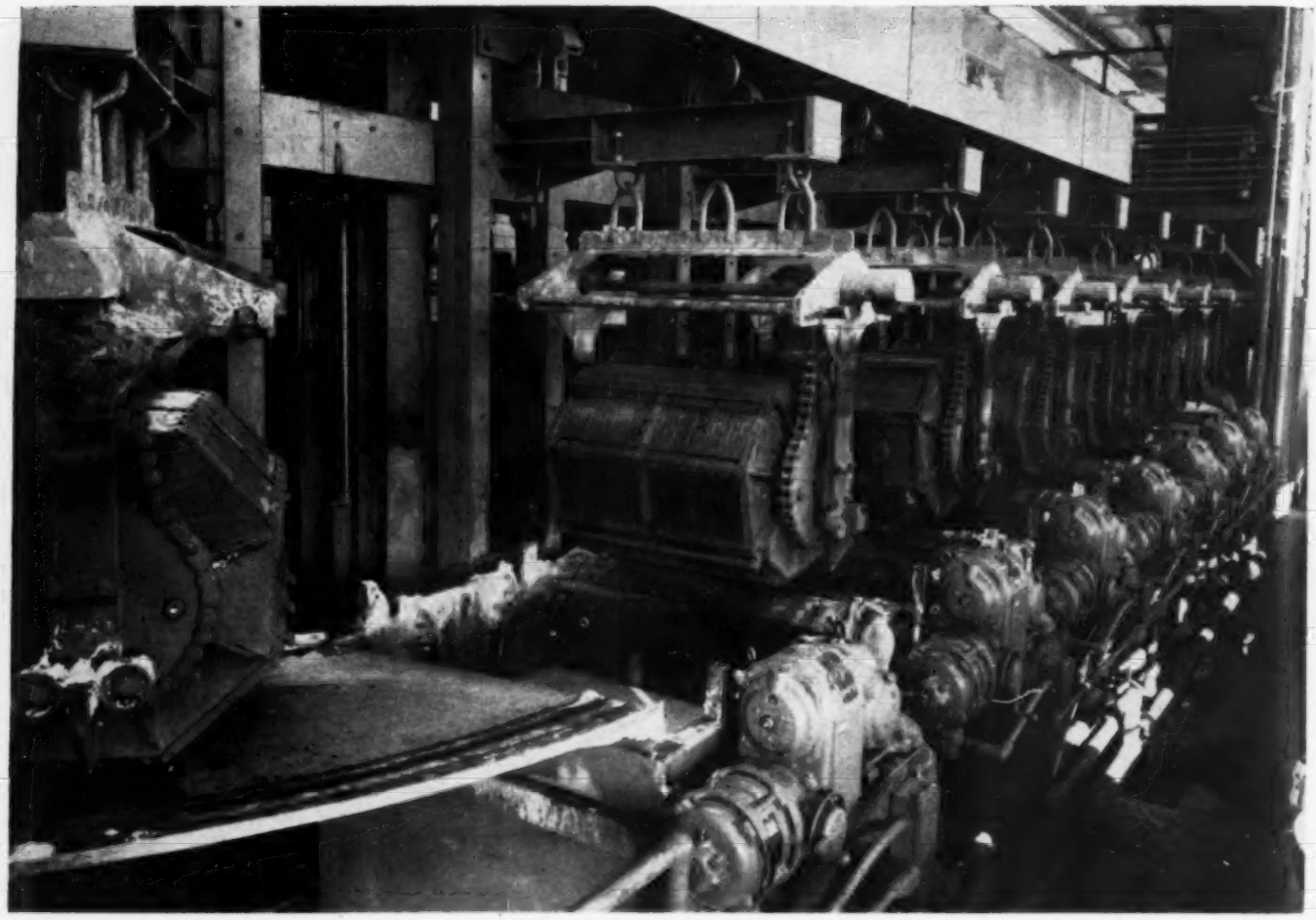
Project Manager—Processing
Electric Typewriter Division
International Business Machines
Corporation

● Automatic, sequential deburring, surface cleaning and burnishing of electric typewriter components are handled in a sixteen-station submerged barrel machine in the Kingston, New York, plant of IBM. The installation eliminates stopping and changing of barrel contents which would be necessary for a sequence of operations using the conventional type of closed barrels.

Frequently it is desirable to apply a series of finishing operations depending on the type and condition of the parts to be processed and the results required. Using the submerged perforated barrel system with automatic indexing of the barrels between finishing tanks, it is possible to put the barrel through a program of finishing without removing the contents of the barrel.

In this Almco "Sub-O-Matic" machine there are16 perforated barrels that measure 22 x 28 in. and have about 7-cu. ft. capacity. They are arranged for indexing around a loop conveyor above a series of 15 tanks containing different solutions in which the barrels can be immersed and rotated. At one end of the loop, the barrels are moved to a 16th station where the solid contents of the barrel can be unloaded, after which the barrel is reloaded with bonded abrasive chips of No. 3, 3½, 4 or 4½ size, plus the load of parts to be processed.

Besides the barrels and their transfer and rotating mechanisms, the machine includes facilities for handling, screening and sorting the chips and for delivering the re-



RETURN SIDE of machine, showing barrels in indexing position. Barrels pause after each rotation cycle to permit drain-off of compounds and avoid contamination of adjacent tanks. Most of tanks in IBM installation contain polishing compound.

Barrel Finishing at IBM *(continued)*

quired load of chips into the barrels without manual lifting. In addition, there are means for transferring the load discharged from successive barrels to either a magnetic or a screen separator. After parts and chips are separated, the parts are then fed out through a dryer to a tote box and chips are returned to an elevated storage bin for reuse.

After each barrel has been dumped, reloaded and its cover locked in place, the barrel is lifted automatically and is conveyed around the loop. During this circuit, the barrel is lowered and is rotated at 20 rpm for 15 minutes in each of the 15 tanks or in any group called for in the processing schedule. When the conveyor indexes the barrel above any tank in which it is not to be submerged, the barrel is suspended above this tank and skips the treatment involved.

Thus it is possible to apply only such processing as is wanted on each batch. This processing is specified by a card corresponding to the part number of the parts loaded. All barrels are elevated after processing in tanks and pause above the tanks until the solution has drained out. Then all barrels on the processing conveyor are indexed to the next station and rotation starts automatically.

All barrels when submerged are driven by chains and gears when the latter engage pinions of the drive mechanism at each tank.

When, after processing a load, a barrel stops at the unloading station the cover is removed and the barrel is turned until its load falls into a hopper below. From the hopper, the parts and chips feed onto a conveyor that carries them to a magnetic separator. Chips fall into an elevator and parts pass through a dryer and thence into a tote box.

After the barrel is discharged, it is lowered to a loading position, and the operator inserts a large flexible hose connected to a chip hopper. In the hopper feeding this chute there is a supply of the chips suited for the lot of parts in the tote pan nearest the operator. After he discharges the load of chips into the barrel, he removes the hose chute, moves the box of parts in front of the barrel and dumps the parts into the barrel.

Then the operator replaces the cover, locks it in place and goes to the control panel where he presses the buttons that control subsequent barrel dipping. There is one row of buttons for each tank. If the "submerge" button in a given row is pressed, the barrel will be submerged in the corresponding tank when it arrives there. If the "hang-up" button is pressed, the barrel will hang above and not enter this tank. The card for a batch of parts tells the operator what schedule to set on the panel.

After a pan load of parts is put in the barrel, the pan itself is placed on a roller gravity conveyor and feeds through a washer after

which it is ready to be refilled with a batch of parts that has been processed and separated from chips.

Before the next barrel indexes to the loading station, the operator sets the controls for feeding a given size of chips into the barrel and the required load of chips from the corresponding storage bin feeds down through the flexible tube into the barrel. An average load contains about 3,000 parts and the chip load is sufficient to fill about half the barrel, or about 3½ cu. ft.

In the IBM setup, the first tank contains a Supersheen cleaner in water that is heated to 80°-90°F. Water at 90°F is used for rinsing in tank No. 2. Tanks Nos. 3, 4 and 5 contain a solution of No. 17 S powder, this being an acid for descaling, held at 100°-110°F. These tanks are used chiefly for parts coming from heat-treatment. Tank No. 6 contains a 90°F water rinse and tanks No. 7 to 13 inclusive hold a solution of No. 10 Supersheen polishing compound at 80°F. Water at 90°F for rinsing is in tank No. 14 and No. 15 contains a solution of Nos. 7S and 50RS Supersheen compounds heated to 90°F, this being a rust inhibitor.

A typical cycle of the machine is set for a 15-min. dwell at each station (whether the barrel is submerged or suspended). The total time per cycle is 4 hr. During this time, however, 16 barrel loads are handled. Only one man is needed and since he can load and unload 32 barrels per 8-hr. shift, the labor cost is low. This cycle can be decreased or increased depending on the parts being processed. Material costs are about the same as for equivalent processing in a nonautomatic set of equivalent tumbling operations.

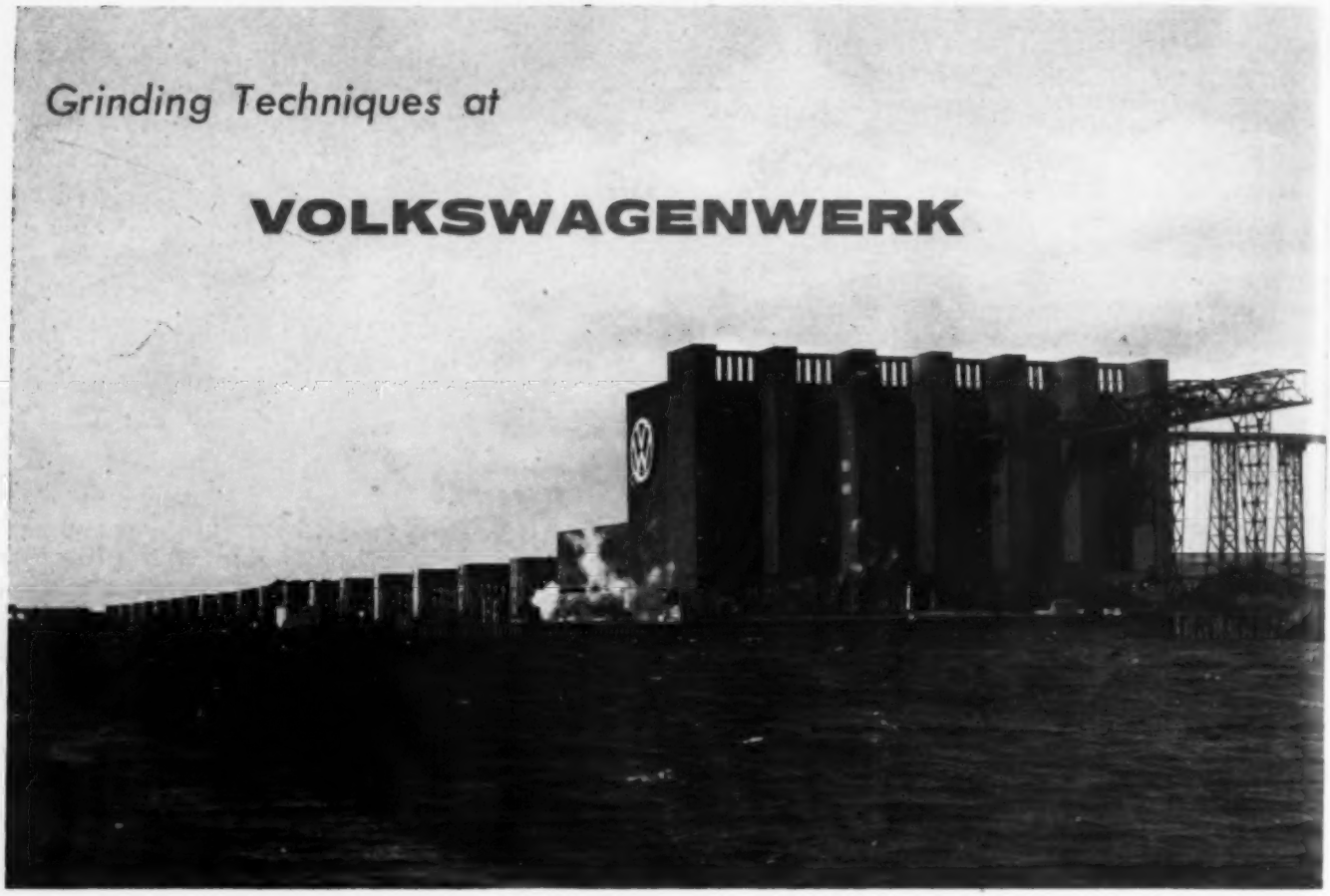
Nearly half the tanks are set up for polishing but only a fraction of these may be needed for parts that are smooth and have some initial polish or for those of metal that polishes easily. Parts of a given material in a given initial condition often require different degrees of polishing and this can be attained by varying the number of polishing tanks used. • • •

OPERATOR DUMPS batch of parts into barrel after loading charge of abrasive chips from overhead hopper, top left. Four sizes of chips are used in IBM installation. Control panel, left, programs finishing cycle individually for each barrel, depending on type and condition of parts, work required.

MAGNETIC SEPARATOR, center, extracts parts from media. Chips are carried by elevator to overhead classifier for return to storage bin over loading station. Port pans, left, are on way to washer.

Grinding Techniques at

VOLKSWAGENWERK



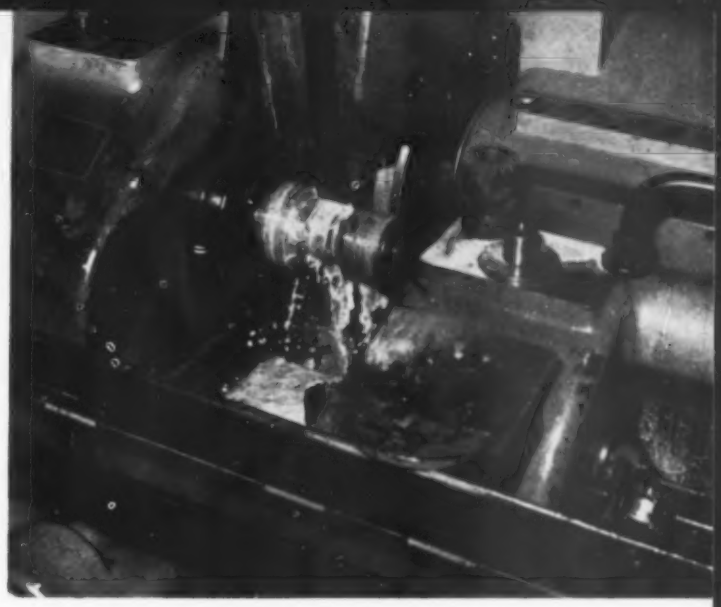
Highlights of some of the grinding techniques employed on gears, crankshaft bearings and the camshaft of the Volkswagen in the West Germany plant where anticipated production for 1957 is 400,000 units.

By **William F. Schleicher**

V.P. and Editorial Director

GRINDING THE DRIVE SHAFT on a Naxos machine. A 32-in. wheel, L hardness, 60-80 grit, vitrified wheel is used. The depth of cut is .0008-in.

GRINDING SPLINES AND SHAFT ON SPIRAL BEVEL GEAR SHAFT using two wheels. Depth of cut is .0008-in. The wheels are vitrified, 60 grit, K hardness and 46 grit, K hardness. The splined surfaces are checked by hand while an automatic size control mechanism checks the shaft.

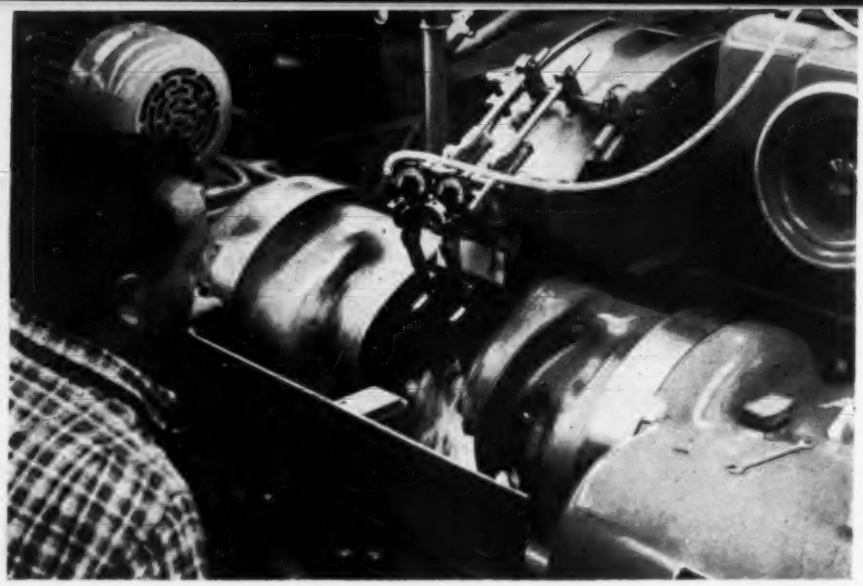


GRINDING DIAMETER OF COMPENSATING GEAR on a Schaudt grinder. Diameter of work before grinding is 2.60-in. Tolerances are 2.5976-2.5946. Diameter of vitrified wheel is 24-in. with a 1 ¼-in. face, turning at 5,460 rpm. A grit of 60 with an M hardness is used.

Here's how gears are ground by plunge and surface methods

SURFACE GRINDING OF SYNCHRONIZED THIRD GEAR. Seventy-two pieces are held on a magnetic chuck on this Naxos grinder. A segmented 24-in. wheel, H hardness, 24-36 grit is used. Tolerance is .002-in.

GRINDING SLEEVE ON SYNCHRONIZED THIRD GEAR. Two diameters are form ground on two gears simultaneously. A tolerance of .00052-in. and a surface finish of 2 micro inches is maintained. Vitrified wheel has a grit of 60-80 and is of K hardness, turning at 2,952 rpm. Note that the piece part is only supported at one end; an expanding mandrel is used.

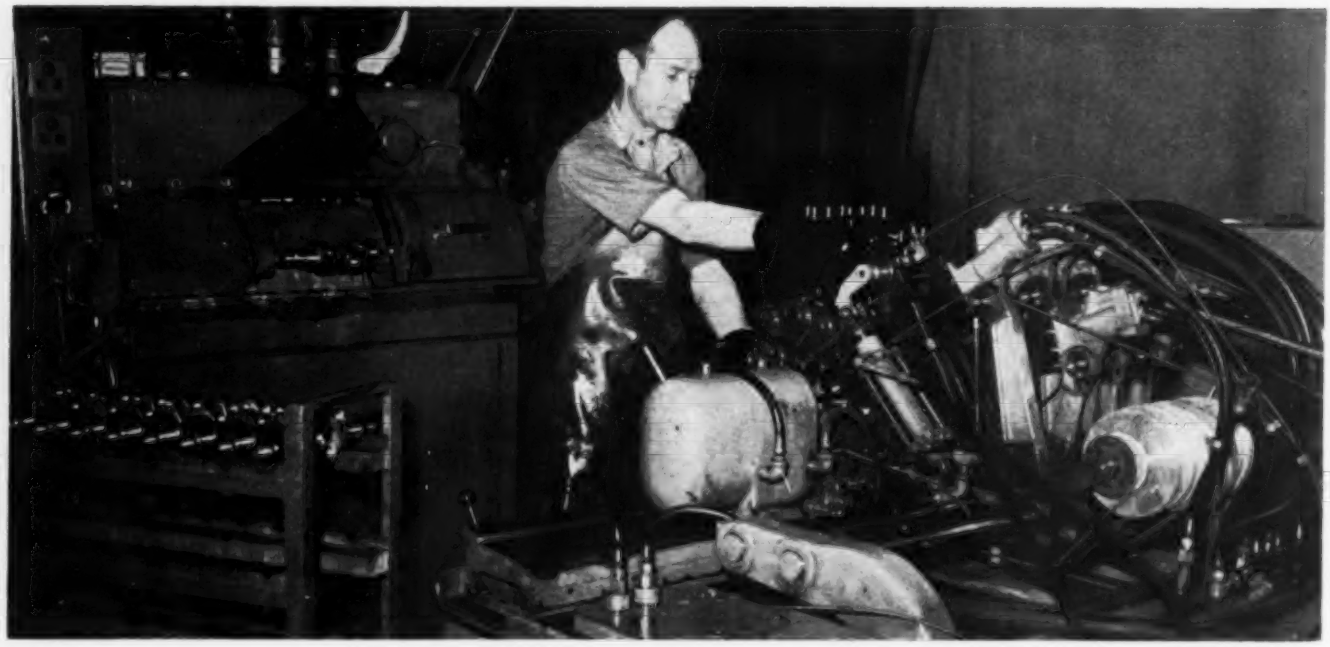


EIGHT BEARING SURFACES of crankshaft have hardness of 63 Rockwell. Sizing and operation of the machine is electronically controlled. Accurate copy lathe work in preceding operation on Fischer machine aids in this grinding job. LeBlond crankshaft lathe turns other surfaces.

When finish grinding the three main bearing surfaces of the crankshaft the shoulder is ground at the same time. The wheel is a 40-60 grain wheel with an M hardness. Speed of the wheel is 7,722 F.P.M.

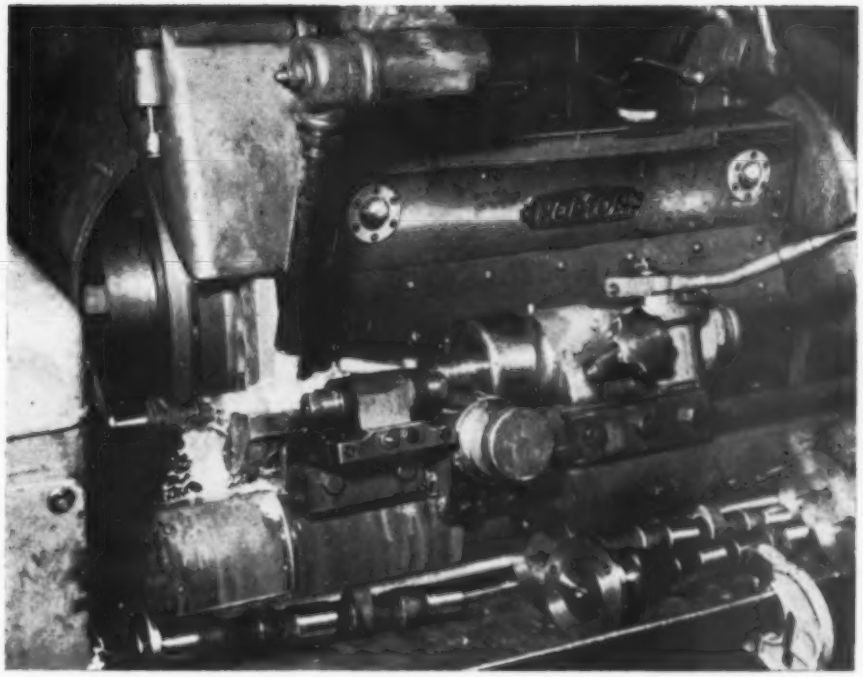
Grinding and Lapping the crankshaft

Rough and finish grinding operations are performed on eight bearing surfaces within tolerance variations of .000064-in. and .000044-in. Lapping operation improves finish to 2 micro inches.



THIS IS THE CRANKSHAFT LAPPING OPERATION where a surface finish of 2 micro inches is attained. All eight bearing surfaces are lapped simultaneously on this Norton machine. The emery cloth, Aloxite M 320 J, unravels from the large spools at the rear of the machine and is wound up on smaller spools in the front of the machine.

Grinding the Camshaft



Rough Grinding

The head stock revolves at 115 rpm., during the rough grinding operation while the grinding wheel has a speed of 4620 rpm. The wheel is aluminum oxide.

Finish Grinding

AN AUTOMATIC SIZING ARRANGEMENT is used when finish grinding the camshaft. Pressure to the automatic sizing mechanism is by means of oil. The depth of cut is .160-in. Diameter of the vitrified aluminum oxide wheel is 24-in., grain size is 60. The wheel revolves at 4620 rpm. The final surface finish is 6 micro inches, obtained without lapping.

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GRINDING safely

by **Edmund Mottershead,** President
Mottershead Associates, Chicago

SAFE GRINDING is achieved on a shop-wide basis only when every worker who must use the machines does so correctly. Here a workman is performing a routine task of tool sharpening, using face shield provided at the grinding station. Note, perform side grinding only on wheels designed for this work.

HARD, FAST, ROUGH WORK like snagging these castings calls for strength and coordination on the part of the workman. Castings are hung in a chain sling to support weight and balance them for easier handling. Operator wears goggles, heavy gloves, leather apron and other protective clothing.

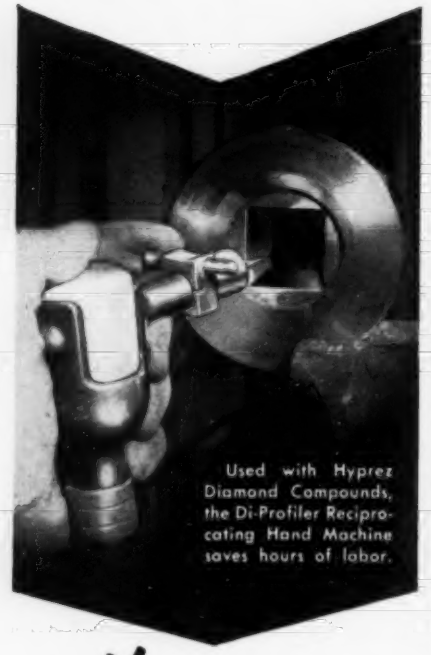
HIGH PRODUCTION SNAGGING of heavy castings is safe when the operator works safely. Guard flaps are kept down to within an inch or so of the wheel face to minimize dust and chips thrown at the operator, who also is protected with goggles, safety shoes, leggings and leather sleeves.

● Like many other production jobs, grinding heavy castings or sharpening tools are not jobs for careless or timid men. When machine and wheel are in good condition and properly guarded, grinding is a safe occupation. Any sensible operator will turn on the machine and stand to one side for a moment until it is clear that the device is operating properly.

Side grind only on wheels built for this purpose. Wheels which are made for face grinding only will not only deliver poor results when used for side grinding, but will tend to break up faster. Remember that a grinding wheel is essentially a vast number of small cutting points held together in a bond which is strong enough to hold them but friable enough to break up and bring new cutting points to the surface. Side grinding on the wrong wheel creates pressures for which the wheel was not created, tending to make it break up.

Most grinder operators know that crowding the wheel so that the rim heats up ahead of the rest of the wheel weakens the wheel so that it may eventually crack and break during operation. However, the grinder operator can be too timid.

Plunge cut grinding, for example, can often be performed with fairly heavy cuts and still get a good finish by dressing the wheel correctly. There is a natural tendency for a new operator, who automatically will dress the wheel when he starts to work, to dress it a bit fine because he wants a good finish. The result, particularly with an infeed which is too slow, will glaze up the wheel, develop chatter and overheat the work. Simply redressing the wheel fairly coarse, and rough grinding with a fast infeed to take off a substantial amount of stock, takes off the metal satisfactorily. Then, in taking off the last few thousandths, letting the cut spark out brings in the finish as it should be. • •



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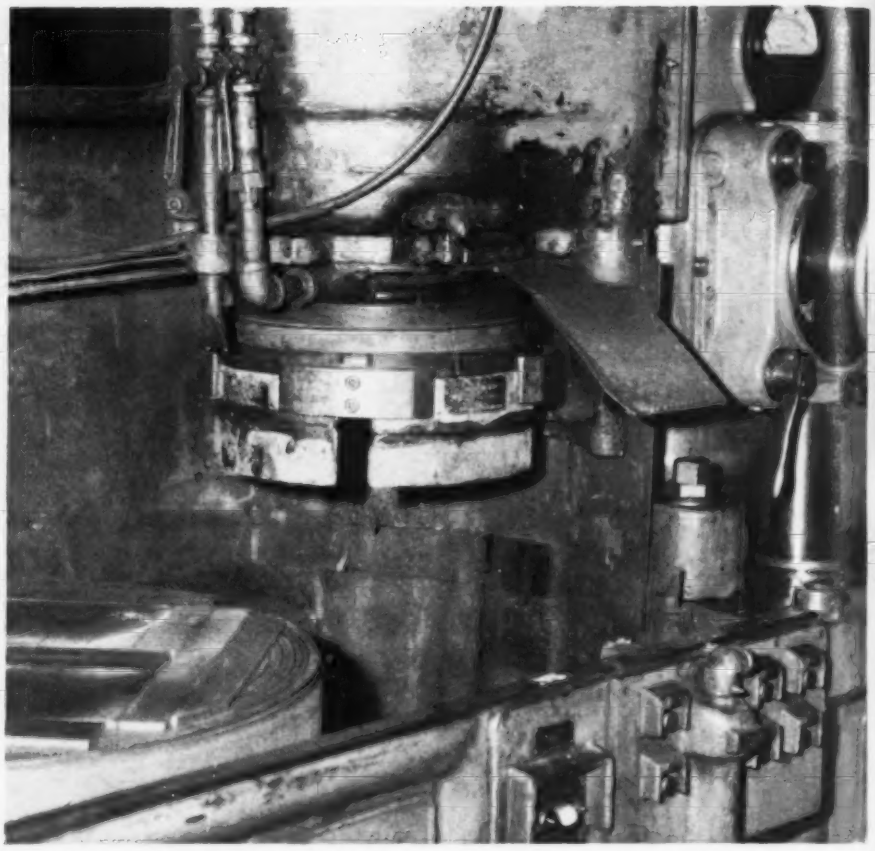


RECLAIMED SEGMENTS IN USE on a Blanchard grinder show clearly the cemented joint where used stubs were bonded. Simple bonding procedure utilizes stubs otherwise wasted.

Reclaiming Grinding Segments

Segment stubs are salvaged by cementing them together and using them over and over. Makes usable the 25% of segment held in chuck and usually thrown away. One die set manufacturer reports 2-year savings of $15,000.

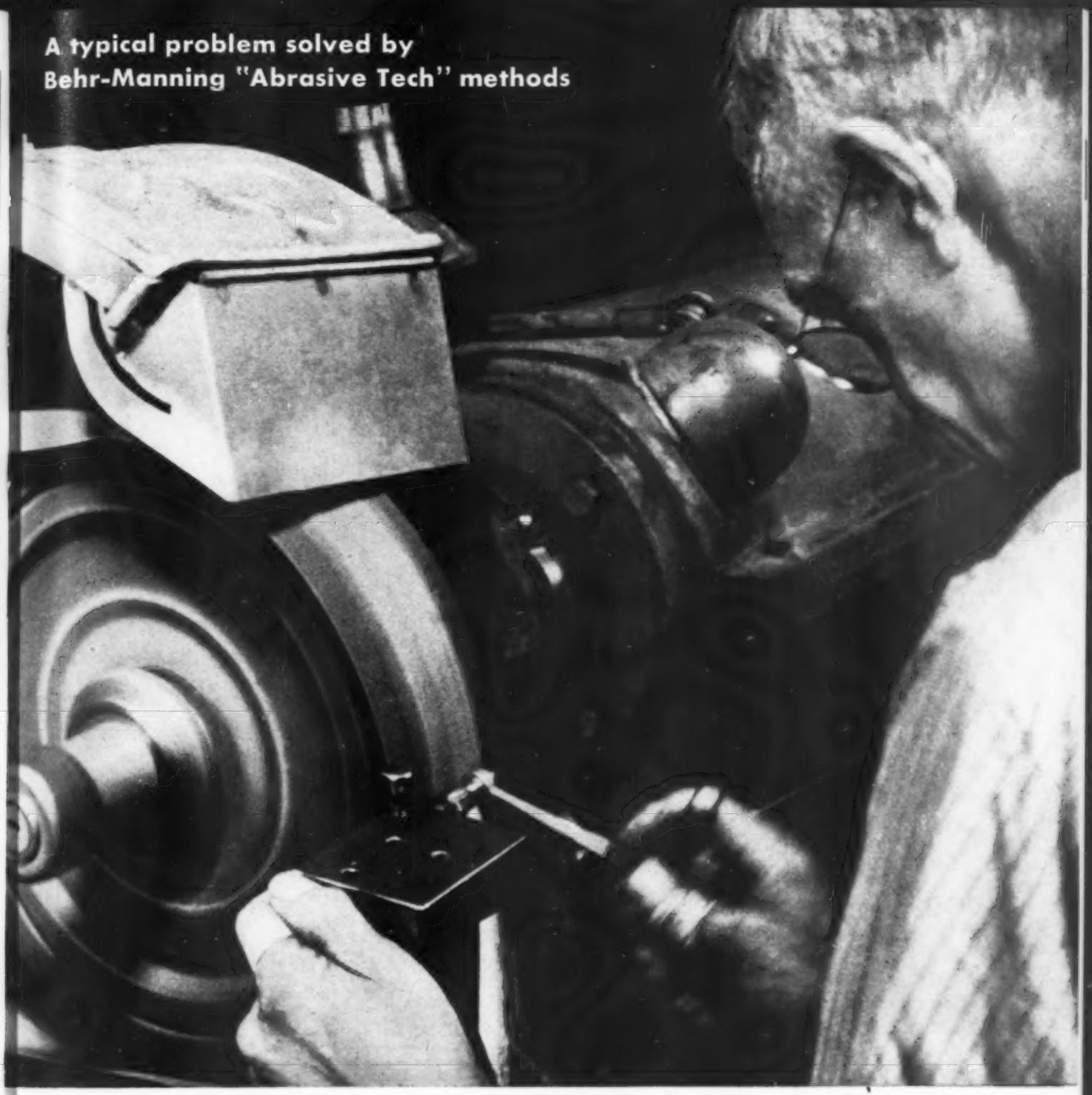
● A recently developed bonding process makes it possible to salvage the unused portion of grinding wheels segments used on Blanchard and similar grinders. Stubs of the segments are cemented together after they are worn to about 1/3 their original size, giving almost indefinite use with no loss of the segments. In use by several companies manufacturing die sets, electrical equipment, ball bearings, aircraft parts and other products, the reclaiming process is responsible for considerable savings in use of the expensive segments.

The Standard Die Set Company, Providence, has reported savings in a two-year period of approximately $15,000. A small manufacturer of aircraft parts has saved over $3600 in a five-month period, while a medium-sized electrical manufacturer reports savings of over $5000 in the last six months of 1956.

The procedure is quite simple. Segments which are worn to about one-third their original size are stacked on a bench and cleaned with a wire brush. Then a hardening agent is poured into a can containing the bonding material, which is known as Gaff Bond 344. Hardener and Gaff Bond are mixed until the mixture is a uniform color.

The mixture is applied to both

(Continued page 52)



Here's how production jumped 23%: The outside diameter of the box end of this wrench is being polished with a simple fixture and one pass on a Metalite coated abrasive belt. The result of this "Abrasive Tech" method is fast, consistent polishing, since rotation and pressure of the wrench against the belt are always uniform.

Very often a Behr-Manning methods engineer can provide a helping hand with different finishing problems. Just call the nearest Behr-Manning office for a date. There are 17 well-equipped "Abrasive Tech" Methods Rooms, available for problem-solving, or helping finishers brush up on new techniques: Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Grand Rapids, High Point, Indianapolis, Los Angeles, Teterboro, Camden, San Francisco, Seattle, St. Louis, and Brantford, Canada. Main office and plant, Troy, N. Y. For Export: Norton Behr-Manning Overseas, Inc., Troy, N. Y., U.S.A.

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continued

surfaces to be joined. Three segments or stubs are clamped together with a large C-clamp, and the cemented stones are stored for 48 hours before they're suitable for use again on the machine.

An important saving is the elimination of at least one dressing operation. One lowering and blocking operation is also saved. Usually when a new set of segments is placed in operation, they must be dressed once in preparation for grinding. After one-half of the stones are used, they must be reblocked or lowered and dressed again. The amount of usable grinding height that remains is only about one-third or less, making the lowering and dressing operation not very efficient.

The new bonding material was originally strength-tested at an electrical manufacturer's plant, using porcelain insulators. In a straight pull test, the porcelain gave way at 15,000 pounds, while the cement remained sound. Grinding segments were then tried successfully on production jobs at four times normal downfeed. Strength tests by other laboratories have proved the adequate strength of the new bonding method. • • •

PROCEDURE . . .
1. HERE ARE THE STEPS IN using the new bonding material. First, segment stubs are cleaned with a wire brush.

2. MIXTURE OF GAFF BOND and hardening agents is then prepared and applied to both surfaces to be joined. Cemented segment will consist of 3 stubs.

3. C-CLAMPS THEN SECURE the three segment stubs during the storage period of about 48 hours. Ten sets of segments represent approximately $98.

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WALKER engineers have designed a rotary magnetic chuck with a T-slot type 4-pole face plate upon which segmental magnetic drivers can be used. These drivers are key guided for in-and-out adjustment to cover large range of diameters; and are attached by T-nuts. The holding force can be varied by use of neutrolator from maximum strength to a degree to allow for slippage when used in conjunction with a shoe type support.

This new WALKER development has solved many of the bearing ring holding problems resulting in accuracy, speed, increased production and lower unit costs.

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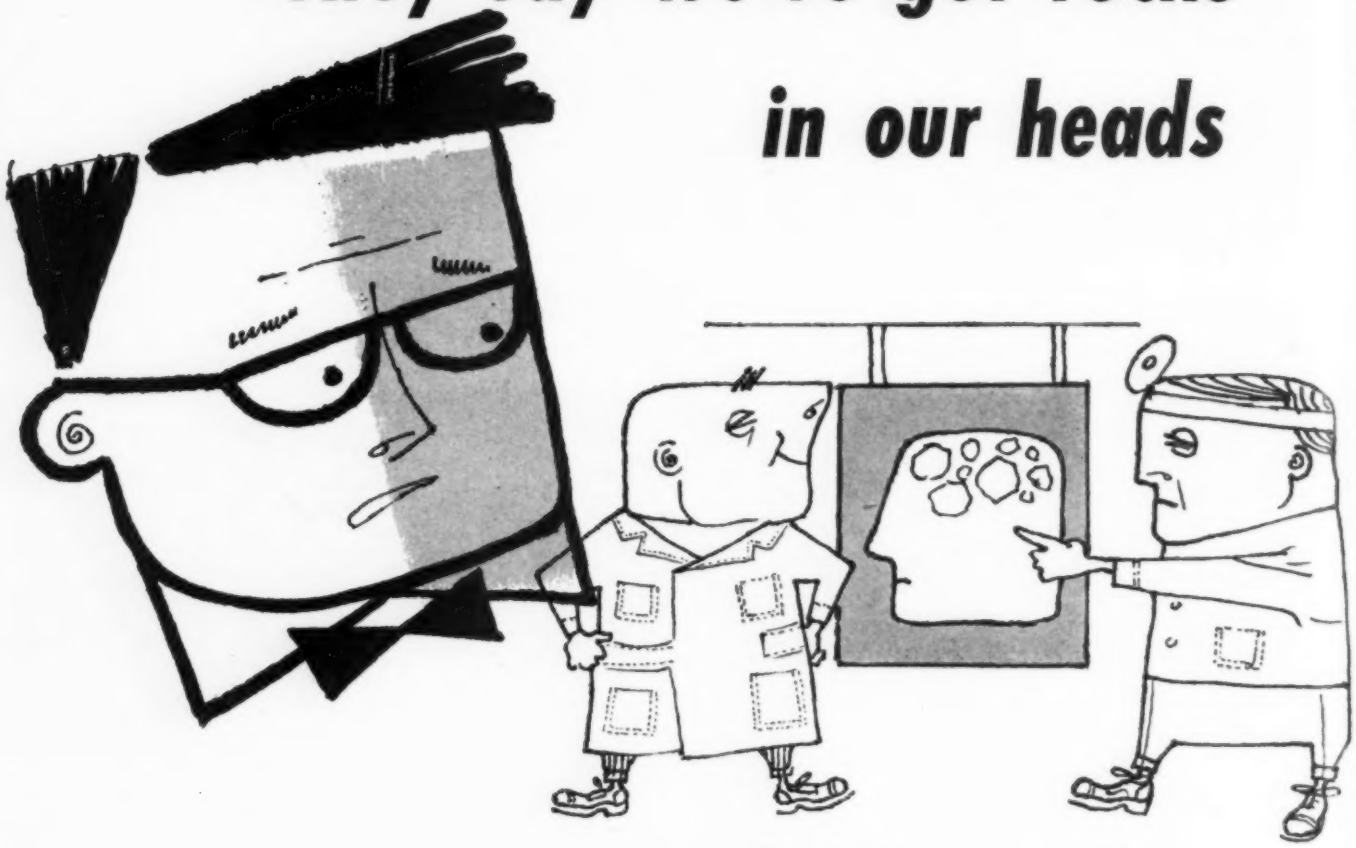
They say we've got rocks in our heads



—and it's true!

We really don't mind this sort of talk. It's our business to have the types of "rocks" on our minds that are saving millions of dollars in the finishing of manufactured parts.

Roto-Finish people have studied abrasive chips and compounds since the day they pioneered the idea of precision barrel finishing. The development of new and better media for specific finishing problems has made Roto-Finish the leader in mechanical finishing. Years of research and experience in barrel finishing techniques give Roto-Finish the "know-how" to recommend the right media to do the job you want done.

If you're not satisfied with your finishing production, look to Roto-Finish for the answer. Simply send samples of your unfinished parts, a finished part, a description of your production requirements and a list of the equipment you have available. We'll prove that you can save with Roto-Finish and we'll guarantee the same results in your plant that are achieved in sample processing.

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Recent and Quotable

—excerpts from recent speeches which have great pertinence to the nation's metalworking industry.

Automation

"Automation will not be the exclusive domain of the big corporations," says Malcolm P. Ferguson, president of Bendix Aviation, at the International Conference of Manufacturers.

"Management will, of course, play a big role in determining progress toward automation. But it will not only initiate automation. It will be in the midst of all the changes which the new technology will bring and will have to adapt itself to them. We will need more management . . . tighter control and coordination of every detail of the production process . . . and probably more individuals at every level making more decisions of a management type than they had previously.

"No machine, however 'automated,' can be trained to meet all unforeseen developments in the light of an understanding of general objectives. Machines can be built with a memory for recording past events, but they generally cannot be built with imagination for spotting new possibilities. Photoelectric cells can 'see' certain marks, but they do not possess 'vision' in the higher sense. These functions—judgment, appraisal and imagination—still belong exclusively to human beings.

"Automation will not be the exclusive domain of the big corporations. It will be adopted, whether by large or small business, if—when all the eventual costs are totaled up—it is actually cheaper and/or better than continuing present methods.

"Look at it this way: It is easier to 'automate' manufacture of a transmission or axle than it is to 'automate' production of a complete automobile. This suggests that the production of component parts by suppliers to numerous industries may lend itself to automation rapidly.

"In conclusion, it is important to note that we now produce twice as much with each hour's labor as our fathers produced just prior to World War I, and four times as much as our grandfathers produced in the 1870's.

"This remarkable achievement was neither accidental, nor the result of planned intervention by government.

"Let us not forget in our concentration upon this topic of automation which emphasizes things—new and fascinating combinations of metal and wires and vacuum tubes and transistors—that all progress is of human origin. The driving force of ambition, the unpredictable course of man's inventiveness, and his knack of using his freedom of enterprise to build organizations that produce useful things and create income-producing jobs—these are the indispensable ingredients of progress.

"So that much as I respect automation and its vast potentialities, I want to close by urging you to pay redoubled attention to the factors which either stimulate or imprison the dynamic capabilities of men and women. What they are inspired to do or prevented from doing will control what really happens to automation." •

Manpower Shortage

"There has been so much hot air and so little real thought that the distant objectives in our current manpower shortage are clouded," says Ohio State University's Gordon B. Carson, Dean of Engineering, speaking on the shortage of technical personnel.

"There has been so much hot air and so little real thought that the distant objectives in our current manpower shortage are clouded.

"There is a critical shortage of engineers and scientists today, as we have pointed out. But this shortage, like any similar problem, has definable causes . . . and a suitable solution.

"We must analyze our problem and break it into its component parts. Obviously, any simple breakdown may be an oversimplification, but at least it will enable us to deal with some of the factors which to date have seemingly escaped notice.

"In the vast number of persons active in our various technologies, there are three distinct groups: (1) scientists, (2) engineers, and (3) technicians. Since shortages exist in all three categories, there has been a tendency to handle the matter as a single problem. It isn't a single problem, in any respect. We need creative thinkers, we need creative and energetic doers, and we need high-caliber technicians—in short, we need a team made up of men from each group.

"Scientists and engineers are more alike than at any time in our technological history. Recently a young Ph.D., on a post-doctoral

continued

tour under the sponsorship of the Ford Foundation, made a study on our campus of the differences between scientists and engineers. He came back after a few days and reported, with some astonishment, that he could find no difference between physicists, chemists, metallurgical engineers, electrical engineers, and mechanical engineers who are working in allied fields. He pointed out that all are working on fundamental problems, expanding the frontiers of knowledge, and tackling the problem through the usual fine mechanism of a scientific approach.

"Perhaps it would be well to sum up the basic difference between a scientist and an engineer in a one-sentence definition: 'An engineer is a scientist with a sense of urgency.'

"Technicians are essentially different. They are the invaluable builders, operators, maintainers, and protectors of known designs, principles, or devices. They have the skill and the know-how to execute the designs of others. They can take the ideas on paper and convert them to realities.

"Let's tackle the problem now from the standpoint of the definable causes which we can handle in this short space. We refer here to those causes responsible for the shortage of scientists and engineers.

1. The astonishing effect on engineering enrollment by an article, given wide circulation by the newspapers of the country, in which an engineer surplus was reported.
2. The current population drop in the 18 to 22 age bracket because of the low birth rate during the depression.
3. The unwillingness of today's high school students to take rigorous courses requiring quantitative thinking.
4. The military "crash" programs, wherein money is no object and ineffective use of engineers is all too common.
5. Unwillingness to compensate suitably in the upper engineering brackets, which results in the loss of better men to administrative and executive work.
6. The lack of sufficient numbers of technical institutes to produce supporting personnel.
7. The military deferment problem.
8. The amazing shortage of qualified high school science and mathematics teachers. ●

Machine Tools

"The year 1956 saw the greatest demands for machine tools that ever occurred in peacetime history . . . but . . . this demand did not have uniform geographical distribution, nor was the demand uniform for various types of tools," said Jerome A. Raterman, president of the National Machine Tool Builders Association, at the Palm Springs AMTDA meeting.

"The year 1956 saw the greatest

(Continued page 58)

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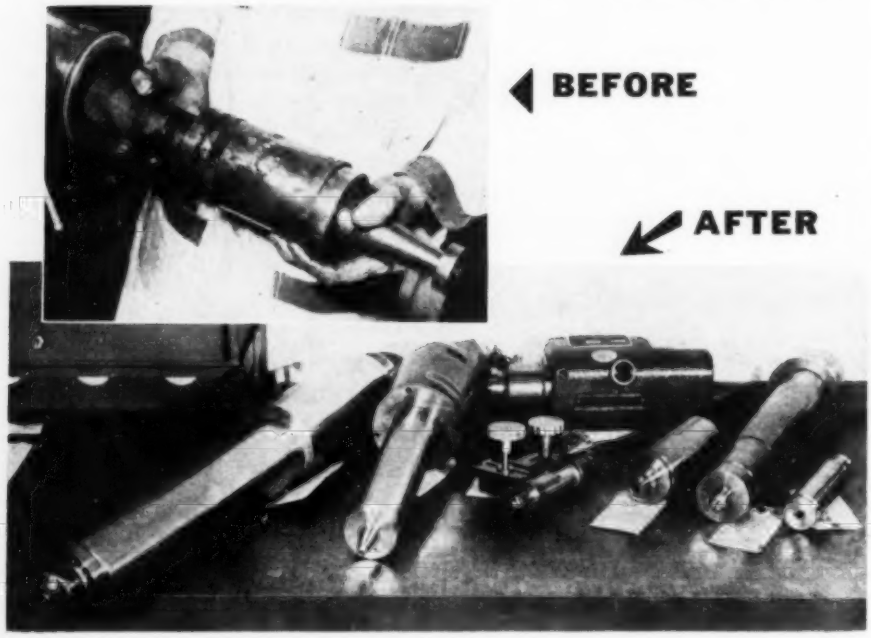

All types and makes of High Speed Internal and External Grinder Spindles and Quills . . . Anti-Friction Live Centers

Restored to Original Accuracy in HOURS . . . Not Weeks!

Gentlemen:
I'd like to have complete information on your spindle repair service.

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mounted wheels

are America's finest

Chicago Wheels are available in all standard sizes and over 200 special shapes. This wide selection of these tough, fast cutting Chicago Mounted Wheels makes it possible for you to choose just exactly the right mounted wheel for your job. And delivery of most Chicago Mounted Wheels is prompt . . . right out of stock.

TRY CHICAGO MOUNTED WHEELS TODAY

Let us send you two samples of these true-running uniform Chicago Mounted Wheels. Try them at no cost to you. Send coupon below.

WHEN YOU THINK OF MOUNTED WHEELS SPECIFY . . . CHICAGO!

CHICAGO MOUNTED WHEELS are manufactured under positive density control to insure peak job performance.

GUARANTEED to stay on their mandrels, they are perfectly balanced, easily dressed, and hold their shape.

SAVE TIME, MONEY, MATERIALS . . . any number of combinations of dimension, shape, grain size and bond.

Chicago Wheel and Mfg. Co.

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SEND ME SAMPLE CHICAGO MOUNTED WHEELS

Name .....

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continued

demand for machine tools that ever occurred in peacetime history.

"But for reasons well-known to all of you, and as is always expected, this demand did not have uniform geographical distribution, nor was the demand uniform for various types of tools.

"This ebb and flow of demand is hard to explain. For example, there are fifteen lathe builders reporting to our Association. Lathes, as you all know, are one of the most commonly used types of machine tools, and yet I have seen total demand for lathes go as high as 10 per cent of the entire machine tool output, and as low as 2½ per cent. This, gentlemen, is a spread of 4 to 1.

"So you can see that it is possible for a builder of one type of machine tools to have a depression during a period of general prosperity. This fluctuation, I understand, occurs in practically all lines of machine tools.

"While by and large 1956 was a period of prosperity for the builder, many of them had problems coming from a variety of sources; and these problems arose during the period of highest peacetime demand.

"There are many reasons for this.

"The main reason was the fact that a large number of companies had developed new models for the 1955 Machine Tool Show and incurred the cost of model changeovers in plants following the Show.

"To give our customers the new features that they desire, machine tools are becoming more and more complicated. This fact, coupled with the necessity of doing expert tooling for inexperienced help, and after giving due credit to inflation, makes model changes six to eight times more expensive than pre-war.

"Another reason for squeezed profits is due to carrying a large backlog in periods of inflation. Many of us builders, it seems, are rather slow to realize all of the facts of life. For instance, when we are pressed into signing a new labor contract, it either takes effect immediately, or it is retroactive; and I have yet to meet a labor leader who will sympathize with you because you have a six months backlog. And when your foundry man calls on you and tearfully tells you that increased freight rates apply to moulding sand, core sand and coke as well, to say nothing of the price of labor and scrap, well, when you see his back going out your door, brother, you are already paying a higher price, backlog notwithstanding. And it has long been a tradition in the steel industry, that when they sign a labor contract at 11:59 P. M., we pay the higher price at midnight.

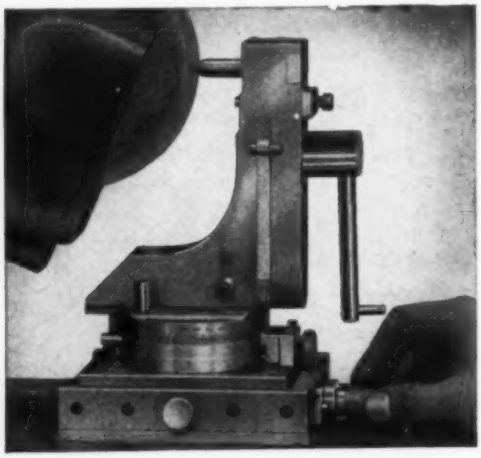
"Besides the Profit and Loss Statement of our industry, the Balance Sheets should come under observation as well. Many companies have incurred rather heavy borrowing, and the reasons are many. The depreciation rates of today do not provide the cash necessary for replacement of equipment at today's higher prices. Nor do wholly amortized plants and equipment add to the cash flow. I do not want to leave you with a lot of financial reports, but I do wish to remind you of the financial risks, the hazards and the responsibilities of the machine tool builder. •

Tough Grinding Wheel Forms Dressed Easy as A, B, C

eliminate elaborate set-ups and operations

.0001" ACCURACY

Fluidmotion
WHEEL DRESSERS
dress two angles tangent to a radius in one continuous motion



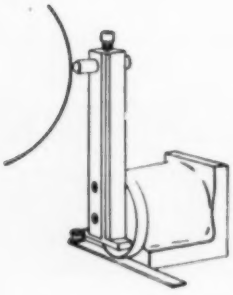
With the unique "Fluidmotion" Dresser, you can dress two angles tangent to a radius — using one handle in one continuous motion. Operation is so fast and simple that beginners can use them.

Adaptable to all type cylindrical and surface grinders.

A. Obtain micrometer reading; add required convex radius or subtract required concave radius.

B. Loosen jib with wrench and "mike" over lower pins to reading obtained above.

C. Tighten jib. Set stops for two angles. Ready for action.



Also available: "FORM MASTER" Dresser, capable of dressing any radii up to 12" convex, up to 15" concave.

See your industrial distributor or write for free literature.

WHEEL DRESSERS J&S TOOL CO. INC. JAW CLAMPS • PRECISION VISES • DOWN-HOLDING DEVICES **CLAMPCUT**

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Machine Tool Distribution

Speaking of machine tool purchase planning by the metalworking industries, Joseph F. Owens, president of the American Machine Tool Distributors' Association, says, "18% are increasing their buying over original plans."

"One thing we can't sweep under the rug—and I am sure none of us would want to—is the fact that some undercurrents of pessimism have crept into both public and private conversation about the country's business outlook, and specifically about the outlook for the machine tool industry. Despite the underlying strength of our economy, there seems to be a disposition in some quarters to headline relatively small soft spots as pointing to a general decline in business.

"Now instead of playing ostrich about these minor notes—and burying our heads in this desert sand—I would like to persuade all of you to remember that we in machine tool distribution have an obligation to the industry we serve to use every fact, figure and other selling data we have at our disposal to sustain optimistic, constructive points of view both in our own organizations and among our business associates and customers. It's up to us as salesmen to work and live by the principle that the optimist sees the doughnut and the pessimist sees the hole.

"I am convinced that we can be highly realistic about our optimism, in the light of the known current facts. Just before this meeting opened, we conducted a survey among a cross section of your Association's Members to find out what's been happening to the 1957 distributor volume across the country. You will be encouraged as I am to note that thus far this year new orders for machine tools sold through distributors are generally equal to and ahead of January and February 1956. New orders for 1957 in some areas, including metropolitan New York on the east coast, the South—most of the midwest and southwest and Pacific Northwest—are up 10 to 50% over last year. Remember, these are spot checks—statistically they cannot be averaged to come up with industry or even area figures. But the fact remains that the trend is up—so the results of the first two months are certainly encouraging enough to bear out your Association's year-end forecast that shipments of machine tools sold through distributors will at least maintain 1956 levels and increase from 5 to a conservative 15 per cent in those areas where continued expansion is going to call for newer, more efficient and more productive machine tools. Modern manufacturing and metal working plants must have these tools to maintain quality and profit margins and to meet competition—which are necessary objectives in the year ahead.

"It is interesting to note that two other entirely independent sources have come up with very similar figures. Research Institute of America in their February 25th Report, summarized a survey of capital equipment spending programs showing that 'about 20% of companies which had planned to buy equipment in '57 have decided to cut down or refer purchases for the time being. *But 18% are INCREASING their buying over orig-*

BIG in Capacity

HIGH in Filter Efficiency

SMALL in Micro-Inch Particle Size

Delpark Filter-Matic

TUBULAR SCREEN VACUUM FILTER

The response to DELPARK'S FILTER-MATIC vacuum filter has been tremendous. The reasons for such interest is obvious. The DELPARK FILTER-MATIC occupies a minimum of floor space, yet it handles an extremely high rate of flow. With these features, DELPARK engineering has achieved such a high degree of filtration that low micro-inch production finishes are easy to attain.

Permanent filter media used in the DELPARK FILTER-MATIC may be used without filter-aid. Where absolute filtration is required, precoat may be used as needed. Capacities 5-1000 g.p.m.

Write giving complete details for more information on DELPARK FILTER-MATICS *as applied to your filtration problems.*

Delpark

. . . FIRST in Filtration Advancements

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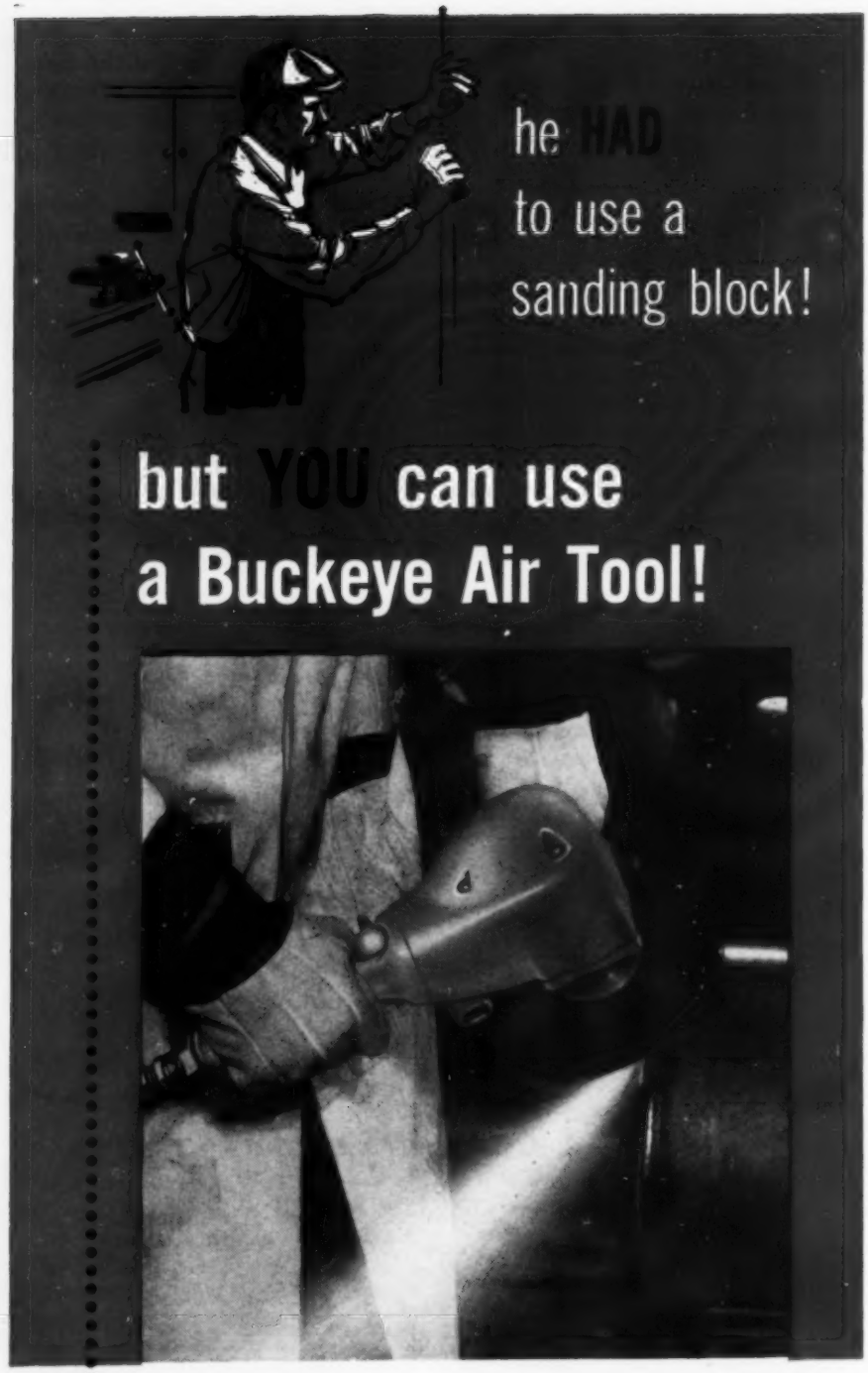

Why AIR Tools?

Because air is everywhere, just waiting to be put to work . . . because continuous operation can't possibly harm an air tool . . . and because, if you're using Buckeye air tools, you can almost forget about tool maintenance.

There was a time when muscle power—and plenty of it—was needed to finish off a smooth surface. Today, air power, directed through a Buckeye tool, has replaced muscle power. The work gets done faster, naturally . . . and better, of course.

We don't imagine you're still using a wood block and emery cloth, but it's just possible you're not using a modern Buckeye air tool. And that's the only way you can be sure you're doing your finishing work the best and most economical way.

Our Catalog A-10 contains complete information on the entire line of Buckeye abrasive tools, all of it both interesting and helpful to all portable tool users. If you don't have a copy, send us your name, company and address and we'll correct that situation promptly.

In Air Tools, Your Best Buy Is Buckeye

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Recent and Quotable

(continued)

inal plans . . . mostly to modernize . . . to meet competition and reduce labor costs. And 60% are going ahead per schedule.' Which the Institute interprets as 'a 78% vote of confidence that any trouble ahead will be relatively minor and short-lived.'" •

Big Business

". . . even our biggest businesses have not been big enough—or strong enough—to stem the tide of inflationary power," says Roger M. Blough, Board Chairman of U. S. Steel, commenting on the role of big business in the economy.

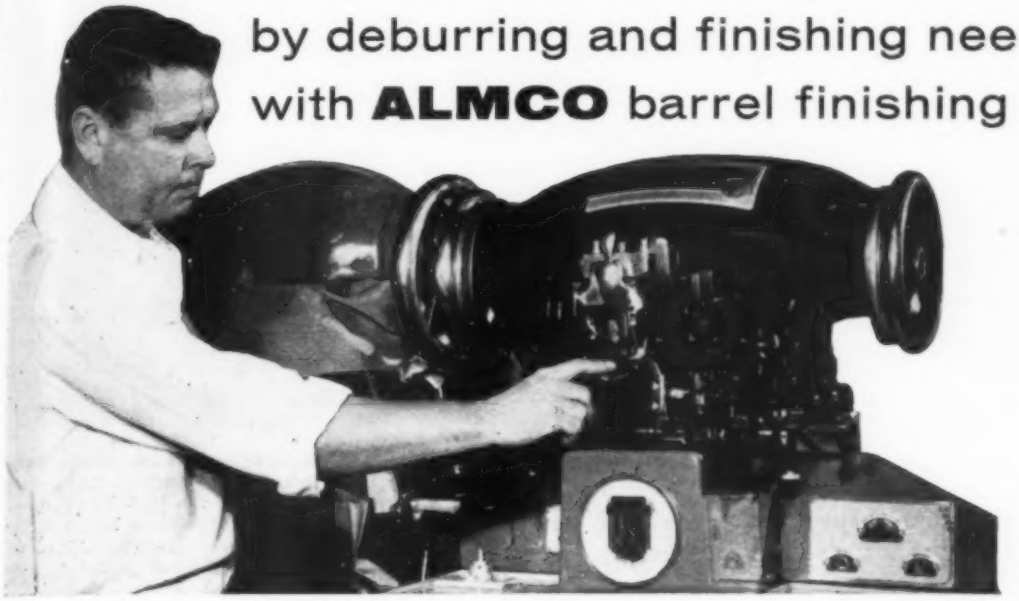
The American people themselves have created big business through their actions as consumers, investors, and workers, Mr. Blough said. "By simply withholding their patronage, their investment, or their services, these people can regulate—or even destroy—their handiwork as their changing expectations may require."

"And when powerful labor unions demand wage increases that vastly exceed the rise in industrial productivity—and thus force prices higher and higher—the whole community looks to big business to hold the line if it can," he said, "to take the strike if it must; and to pay the consequences, whatever they may be. Unfortunately, however, even our biggest businesses have not been big enough—or strong enough—to stem this tide of inflationary power."

Big business, Mr. Blough said, has been most successful in meeting a final expectation—its responsibility to plan ahead and provide the American people with the natural resources they must have to insure the nation's industrial future far beyond the lifetime of any corporate executive now planning and directing the search for those resources. •

FINISHING ENGINEER AT LANDIS MACHINE CO. REPORTS . . .

"We cut costs from 55^{00} to 55¢ per 100 by deburring and finishing needle plates with **ALMCO** barrel finishing equipment"



MR. JAMES W. DUNFORD, finishing engineer at Landis Machine Co., St. Louis, points to location of needle plate in new model of Landis shoe repair machine.

BEFORE AFTER

One of the most successful barrel finishing applications on record at Almco is this needle plate deburring and finishing at Landis Machine Company.

The needle plate forgings are drilled and broached and then carefully deburred. Formerly the tough burrs were removed by hand filing at a cost of $55.00 per 100.

Now, an Almco Model DB-200 barrel finishing machine performs the same operation at a cost of 55¢ per 100, a savings of 99%!

MANY LANDIS PARTS NOW BARREL FINISHED

With this $3,200 annual savings on needle plates alone in mind, Landis engineers have applied the Almco method to other parts until the company is now barrel finishing several hundred different parts to high quality standards. Rejects are practically non-existent.

VERSATILE EQUIPMENT

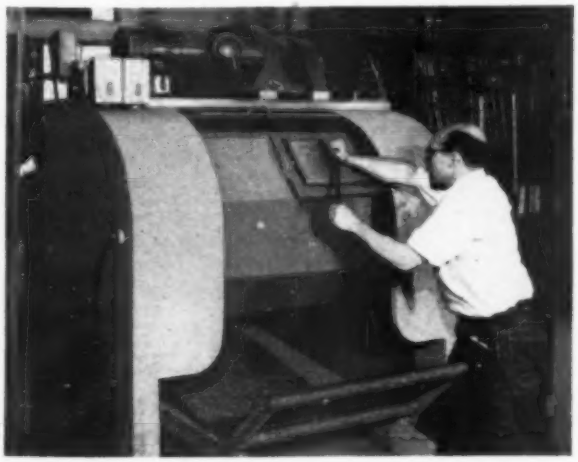
By keeping simple records on processing cycles, correct media and compound, and proper scheduling, Landis engineers can switch the Almco equipment from part to part, to meet plant production requirements exactly.

BROAD EXPERIENCE FOR YOU

Almco's experience in barrel finishing methods and techniques now covers a wide range of parts, sizes, shapes, metals, and operations. Almco maintains sample processing laboratories for the purpose of analyzing product parts and desired results. Let Almco technicians work out procedures to give you the quality you want at the lowest possible finishing cost.

REQUEST YOUR REPORT

Simply write on your company letterhead, requesting an Almco engineer to call on you. Or, send your sample parts and specifications on results direct to Almco. You will receive a detailed report at no obligation.



Finishing department operator at Landis Machine Co. gets ready for parts deburring run in Almco barrel finishing machine. Almco construction is heavy-duty throughout, to stand up under rugged requirements month after month.

SEND FOR THIS NEW BARREL FINISHING HANDBOOK

Complete description of the most advanced modern processes. 52 pages of facts, photos, data and cost comparison charts. Write for your personal copy today.

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Sales Engineering Offices in Chicago, Detroit, Los Angeles, Newark, New Haven, Philadelphia and London, England.

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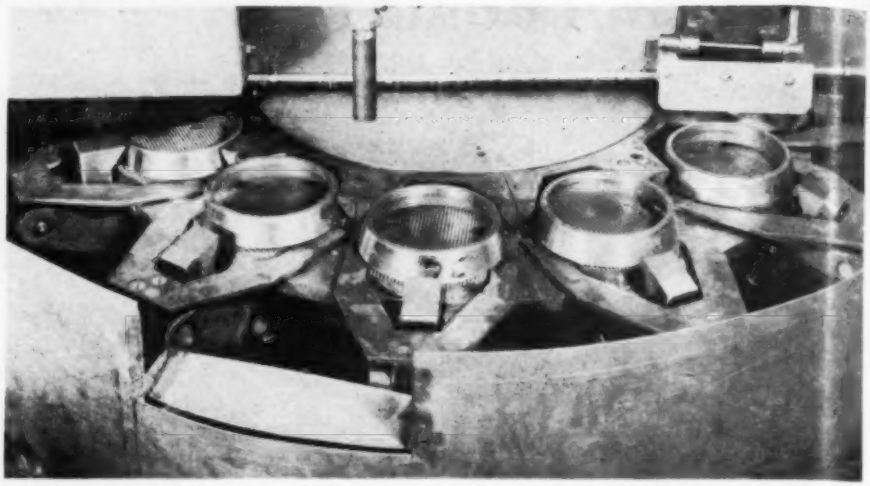
Rotary Grinder Finishes 385 Clutch Cones Per Hour

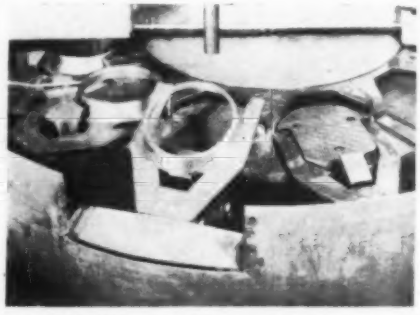
A major automatic transmission plant is turning out 385 finish machined clutch cones per hour on a No. 24-A2 2-spindle vertical rotary automatic surface grinder built by Mattison Machine Works. The only operation performed manually in the entire setup is loading work into the machine. From this point on, all functions, including unloading of the finished work, are performed automatically.

Approximate positioning is all that is required in loading. The part is positioned and clamped for grinding by the clamping finger, which moves forward and holds the part against a notch on the inner ring of the work table.

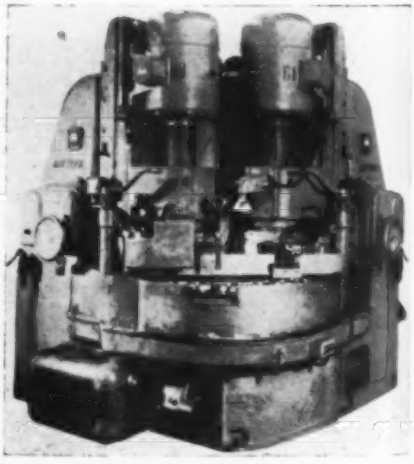
Typical of the automatic safeguards built into the machine is the electrically operated switch on the grinding wheel that shuts down the machine if a part is clamped improperly. Thus, although clamping is fully automatic, there is no



FULLY LOADED TABLE of automatic transmission clutch cones being ground on Mattison No. 24-A2 rotary surface grinder. Table rotates counterclockwise. Guard at right prevents improperly positioned workpiece from passing under grinding wheel.

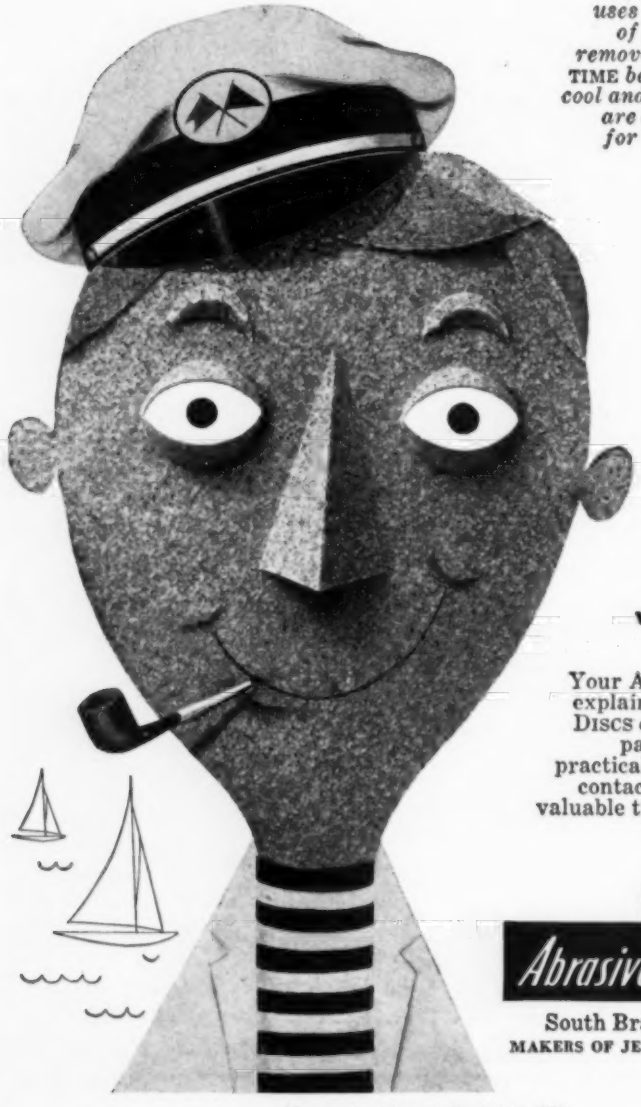


UNLOADING FINISH GROUND clutch cone from MATTISON No. 24-A2 shows relative simplicity of unloading device used.



MATTISON 2-SPINDLE rotary automatic surface grinder rough and finish grinds faces of 385 clutch cones per hour. Operator merely loads parts—machine clamps, grinds, controls size, unclamps and ejects finished parts.

No. 5 *"Roughing it"* with Reddy MacFlint



TIME *for Spring Sailing.* *The auto body man who uses* JEWELOX FIBRE DISCS *of the open coat type for removing heavy paint* SAVES TIME *because these discs stay cool and cut clean longer, and are of sufficient flexibility for use in curved sections of the body.*

"Smoothing the way where the going is rough"

Your AP representative can explain why JEWELOX FIBRE DISCS do not fill up on heavy paint removal jobs. His practical knowledge and shop contacts may help you save valuable time on some abrasive operation. Try him.

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danger, even if a part is placed improperly into the machine by an inattentive operator, that it will damage either the grinding wheel or itself.

Stock removal is .010 to .015 inch on one side in a single pass under both heads of the machine. Automatic sizing is provided at both the roughing and finishing wheels. Additional limit switch protection is built into the machine so that the automatic sizer ceases to function when the useful limit of wheel wear is reached and a red light flashes to warn the operator that it is time to change wheels.

Work is unloaded automatically after it has passed under the finishing head. A cam releases the part-holding clamp and the fork located below the part-holding fixture tilts to slide the finished part into the exit chute. •

Steel Shot Abrasive Cuts Foundry Cleaning Costs

Steel shot abrasive reduces foundry blast cleaning costs, according to test data assembled by Unitcast Corporation, Toledo, Ohio. Unitcast has a total of 9 airless abrasive blast cleaning machines in its plants. These handle alloy steel castings for the railroad, automotive, and coal mining machinery industries.

At one plant where 56 tons of steel are poured per day, 3 abrasive blast cleaners are used. All 56 tons are cleaned in the green state with gates and risers on. 28 tons are cleaned later in the annealed state, without gates and risers. This makes a total cleaning task of 84 tons a day.

Unitcast first used malleable iron shot in their blast cleaners and then the steel shot. Figures from Unitcast's regular quarterly material cost reports indicate a malleable iron abrasive cost for three quarter periods of $1.40, $1.43, and $1.35 per ton, respectively. For the next test, the cleaning equipment was operated with heat treated cast steel shot. Shot with a nominal particle diameter of .055" was used. The lowest abrasive cost per ton reported for a quarter was 57c. Abrasive cost was therefore lowered by more than 50%. The high tonnage of metal cleaned makes savings total a significant amount. •

THREE BLAST CLEANING MACHINES at plant 1 of Unitcast Corporation, Toledo, Ohio, clean about 84 tons per day of alloy steel castings. Use of heat treated steel shot reduced cleaning costs by 50% over previously-used malleable iron shot.

in this line-up . . .
there's a specific Lapmaster® to give you:
1 Precision Flatness
2 Precision Finish
in production quantities
Parts large or small—tall or squat—whatever the case may be, there's a Lapmaster tailor-made to meet your production requirements at the lowest possible cost per piece.
If you are now lapping by other means—hand scraping or grinding—it will pay you to investigate the Lapmaster. Our fully equipped lapping laboratory is at your disposal to analyze your problem, test run a number of pieces and furnish you with a complete production report without obligation.
"John Crane" Lapmasters are capable of consistently producing flatness to less than one light band (11.6 millionths of an inch), micro-inch finishes of 2 to 3 RMS on all materials including cast iron, steel, magnesium, aluminum, brass, carbon, ceramics and plastics.
Crane Packing Company, 6417 Oakton St., Morton Grove, Ill. (Chicago Suburb).
In Canada. Crane Packing Co., Ltd. 617 Parkdale Avenue, Hamilton, Ontario.
Free data
These 3 booklets on Production Lapping and Light Band Reading are yours for the asking. Write today.
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Proposes Methods Study to Cut Postal Costs

E. A. Cyrol, Chicago management consultant and author of articles in GRINDING AND FINISHING on the subject of standard time data, has come up with an idea to cut costs and increase services in the operation of the United States Post Office, which he is offering as a public service to Postmaster General Arthur E. Summerfield.

In a wire sent to Summerfield, Cyrol offered the services of one of his staff specialists free of charge for one full year in order to make a survey of traffic, material handling, and labor costs of the U.S. postal system. It was estimated that this public service offer would cost Cyrol a minimum of $20,000.

The telegram stated: "In the interests of solving the complex problems of moving the mail to the American public I am offering as a public service to the United States Post Office one of my top staff specialists free of charge for one full year to make a survey of traffic, material handling, and labor costs. I suggest a business-type analysis of post office operations with the goal of reducing costs of post office services to the taxpayer. This business aid to the government, in the form of a domestic aid program, might spread in time to bring to the government the cost-reducing techniques that business has used to bring about to this country the highest standards of living in the world. High taxes and high costs of government services to the taxpayer reduce his standard of living. It is my hope that four or five other top management consultant firms will each make a specialist available in order to provide you with a top-notch task force team with which to work and the end result to cut costs and maintain present services and perhaps even to increase them."

Among Cyrol's clients are Jack and Heintz, Whirlpool, Stewart-Warner, Benjamin Electric, American Machine and Metals, A-P Controls, Ajax Iron Works, R. P. Scherer Corporation, and Lear, Inc.

Cyrol's plans specifically call for an analysis of paper work flow, work measurement, and engineering. The postal system does not have "productive labor," but used "indirect labor" as it is not selling a product. Cyrol's offer is to help set up cost reduction techniques. •

"How to Select the Right Grinding Wheel"

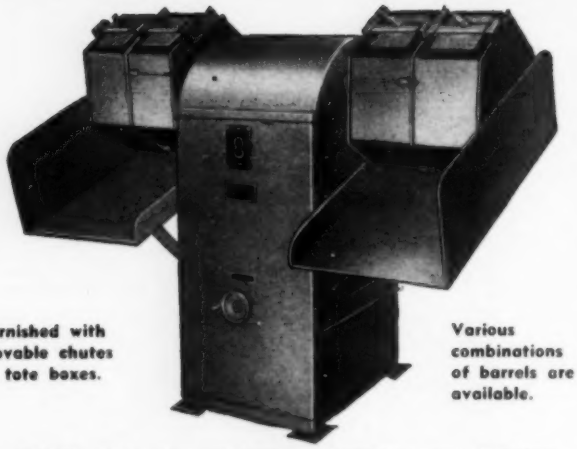
A new motion picture for industrial grinding wheel users, "How to Select the Right Grinding Wheel" has just been completed by Norton Company and prints are now available for booking.

This new film not only explains the meanings of typical grinding wheel markings, but shows the different variations of each unit symbol. It then goes on to actually develop recommended grinding wheel specifications for two different and specific grinding jobs step by step so that the viewer has a clear understanding of the reasons why.

It is 16mm, sound and color and runs 30 minutes. A special condensation of the film story is also available as a handout piece to audiences.

For bookings, write to Norton Company, Worcester 6, Massachusetts or contact any Norton district office. •

NEW MULTI-BARREL FINISHER
handles many small loads



Furnished with movable chutes or tote boxes.

Various combinations of barrels are available.

MODEL RT-6, the multi-purpose tumbling and finishing machine, solves the problem of increasing load capacity without adding separate machines. It handles large or small loads, of one part or a wide variety. It can be furnished with regular-size or smaller barrels . . . for 2, 3 or 4 compartment operation. The RT-6, as illustrated, has four 5-gallon barrels, with Variable Speed Drive from 12 to 36 RPM. Other features include a ½-HP motor, 220/440 volts 3-phase, a watertight switch, and magnetic starter.

FULL DETAILS are given in new Rampe Catalog. Write for your copy today.

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A COMPLETE RANGE OF LABORATORY GRADED DIAMOND ABRASIVES FOR EVERY PURPOSE

STAR DUST DIAMOND WHEELS AND HONES
Superior diamond quality combined with new bonding formula.

STAR DUST Laboratory graded Pure Diamond Powders

STAR DUST Laboratory graded diamond lapping compounds in 18 gram applicator gun—or in 5 gram ophthalmic tipped tube.

You can put your confidence in the STAR DUST line as so many others do because STAR DUST quality is consistent quality—the result of our special process of laboratory crushing and grading to achieve uniform nodular shape. That means *all* particles work for you. Be "Laps Ahead." For easier grinding and mirror finishes specify STAR DUST products.

Send for Catalogue GF-5

ACE ABRASIVE LABORATORIES
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IMPORTANT: For your convenience this sheet is perforated. Tear it out and "buck-slip" it to the proper man in your plant.

Here's the famous V40 Tool Room Wheel in action! Two years of proven industry-wide supremacy have made these V40 wheels "a must" in tool room operations. Check the case history on the back of this page.

Ask the man from **CARBORUNDUM** REGISTERED TRADE MARK **BONDED ABRASIVES DIVISION**

Also makers of a complete line of Coated Abrasives and Abrasive Grain

ATTENTION TOOL ROOM FOREMAN: Turn the page and see the Product Performance Report written especially for you.

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Product Performance Report

GRINDING HIGH SPEED STEEL

Operation	Grind clearance angle on a multi tooth High Speed Steel milling cutter.
Project	Select a wheel to sharpen the cutter, hold concentricity and produce a fine finish at a fast production rate.
Method	Grind cutter with various wheels in a conventional dry grinding manner.
Results	AA60-J8-V40 ground a 6″ x ¾″ x 1¼″—26 tooth milling cutter as follows— **a.** Secondary clearance ground with .003″ infeeds followed by 1 finish pass at .001″. Cutter was in round and finish adequate. **b.** Primary clearance ground with 1 pass at .001″ followed by 1 spark out pass. Cutter was in round within .0002″ and finish was 10 M.I.
Note	Carborundum, leader in abrasive techniques, backs up its products with trained sales representatives, a staff of competent field engineers and an abrasive engineering laboratory... all available to you to put more sense in your abrasive dollar.

Here is another in the series of Product Performance Reports being released by the Bonded Abrasives Division of The Carborundum Company. A color photograph of this actual operation is shown on the back of this page.

• *Ask your local distributor... or the man from*

CARBORUNDUM
REGISTERED TRADE MARK

7811 PRINTED IN U.S.A.

Grinding and Finishing

Free Literature

Use the postpaid card opposite page 96 to receive your copy of any of the literature listed on these pages. Just circle the proper number on the card and mail it. We'll do the rest.

Honing Handbook

No. 550-A, 44-page honing handbook, describes how honing generates diametrically round and straight bores, automatically controlling size within tenths and producing a preselected degree of finish. Book is complete with tables and charts for proper speed selection to obtain desired finishes in various materials. Included are instructions on how to calculate the work stroke for maximum honing efficiency.

Requirements for various applications of honing are described and difficult bores or surfaces are analyzed for production finishing by honing. Abrasive grades and grits are also discussed, as well as various types of cutting fluids.

Barnes Drill Co., Dept. GF, Rockford, Ill.

Use postpaid card. Circle No. 1

Foundry Snagging

The Snag-Master resinoid wheel, for all types of heavy duty foundry snagging, has ingredients in the B29 bond that are claimed to permit each abrasive grain to utilize all its cutting potential, make possible deep cuts without shortening the wheel's life.

Folder P205 available from the Peninsular Grinding Wheel Div., Abrasive and Metal Products Co., 729 Meldrum Ave., Detroit 7, Mich.

Use postpaid card. Circle No. 2

Form Relieving Fixture

Through simple adjustments this universal fixture can relieve grinding tools with radial relief only, axial relief only, or any combination of radial and axial relief. There is no rocking, oscillating or tilting motion of the fixture to produce these grinds. The tool being ground revolves on its own axis and moves on a plane. This keeps the tool at a fixed contact point on the grinding wheel—no rocking above or below center.

All of the motions of the fixture generate from the periphery of a cam. Adjustments can be made from any one cam to vary the amount of relief.

Booklet from Royal Oak Tool & Machine Co., 29800 Stephenson Hwy., Royal Oak, Mich.

Use postpaid card. Circle No. 3

Grinding Wheels

Manufacturer of Dayton-Safety grinding wheels has prepared a new stock list which graphically shows stock wheels available for immediate shipment. They are listed by application. Master list shows all sizes and specifications.

Simonds Worden White Co., Dayton 7, Ohio.

Use postpaid card. Circle No. 4

continued

Bench Centers

Bench centers in two sizes, 18" and 36", provide a simple, accurate means for holding cylindrical work for inspection purposes. As the work is rotated, the runout is shown by the dial indicator. Work mounted on arbors can be checked axially for side runout or camming action.

If inspection or test is desired to unusually close limits, the headstock and footstock centers may be lapped to the work. Headstock and footstock both are adjustable individually. Each may be locked at any position on the bed by lever-operated clamp gibs.

Brown & Sharpe Mfg. Co., Providence 1, R.I.

Use postpaid card. Circle No. 5

Lightweight Air Sander

Description and specifications of what is claimed to be the lightest weight air sander on the market are available in Bulletin No. 800-1. Orbital sander Model 800 weighs only three pounds, and yet has the power and capacity to do even the toughest production sanding jobs.

Included in the bulletin are illustrations of several typical jobs on which the unit is being used. These demonstrate both the sander's high-speed operation and its ability to work in restricted locations.

Magnetic-Pneumatic Div., Sundstrand Machine Tool Co., Rockford, Ill.

Use postpaid card. Circle No. 6

Abrasive Chips, Triangles

Tumbrade-40 abrasive chips and triangular media were developed for mass production barrel finishing of ferrous and nonferrous castings, die castings, steel forgings, and screw machine parts. The chips are available in 15 sizes. The triangles are furnished in four sizes.

Literature describes abrasive characteristics, provides complete specifications. Illustrations of typical barrel finishing machinery are also included.

Macklin Co., Dept. 63, Jackson, Mich.

Use postpaid card. Circle No. 7

Diamond Tools, Wheels

Single stone diamond dressers, boring and turning tools, multiple diamond and cluster tools, contour and radius dressing tools are presented in six-page folder. Boring and turning tools remove stock from bronze, brass, babbitt, aluminum, and other nonferrous metals. Tools are made to customers' specs.

Maurice S. Dessau Co., Inc., 589 Fifth Ave., New York 17, N.Y.

Use postpaid card. Circle No. 8

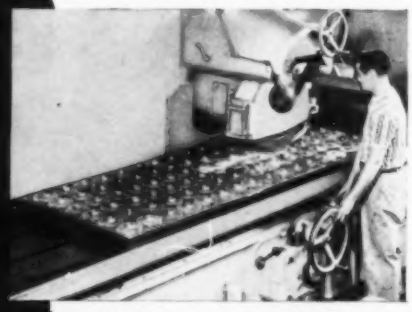
Tracer Controlled Hydraulic Contour Grinder

Contour grinder equipped with standard flat wheels dressed to very simple radii automatically grinds intricate contours, both internal and external. Variable speed workhead also makes polishing and buffing possible. Maintaining accurate contact between the tracer stylus and template is accomplished through three angularity adjustments in a single swivelling or pivoting unit.

Booklet from Industrial Tool Engineering Co., 13849 Keal, Detroit 27, Mich.

Use postpaid card. Circle No. 9

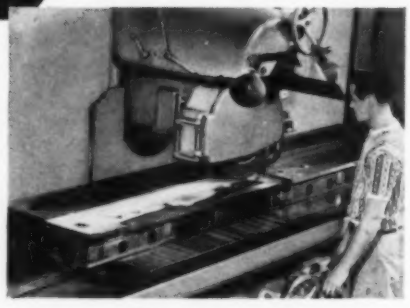
For Holding
SMALL
MEDIUM or
LARGE PARTS



Grinding a load of 102 gears.

Use Sundstrand Magnetic Chucks

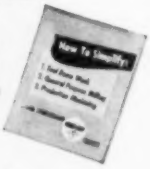
Here's another interesting application of magnetic holding applied to a surface grinder. The deep penetrating power of the Sundstrand magnetic chucks makes it possible to hold a great number of small parts or large castings. In all cases setup is simplified and clamping time is greatly reduced.
Whether you have tool room, production, or special holding problems, look into the possibilities of eliminating expensive clamping and increasing production with Sundstrand Magnetic Chucks.

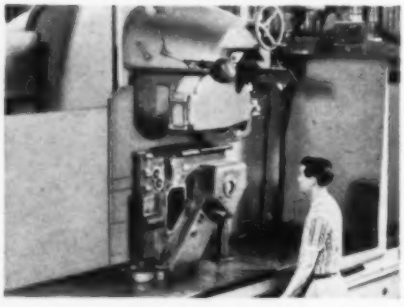


Grinding four slide castings.

Get All the Facts

Write for complete information on these time saving magnetic chucks. Ask for bulletin 379-M.





Grinding drill press frame

SUNDSTRAND
MAGNETIC POWER-GRIP
SUNDSTRAND
Magnetic Products Co.
Division of Sundstrand Machine Tool Co.
1020-9th ST • ROCKFORD, ILLINOIS

Use postpaid card. Circle No. 234

Filters

Brochure illustrates six major filter types for industrial applications. Filters offered include disposable media gravity type, combination gravity and magnetic, straight magnetic, vacuum, pressure and screen-type settling filters. Vacuum and pressure filters utilize permanent filter media which permits use of diatomaceous earth for precoating filter elements. Filter applications include all types of fluids from water to heavy viscosity oils and lubricants. Complete descriptions of filter operation are given as well as applications, degree of filtration and flow rate capacities.

Industrial Filtration Co., Dept. GB-478, Lebanon, Ind.

Use postpaid card. Circle No. 10

Triple Action Barrels

Triple cutting action turns the material over and over, plus an end to end folding-in motion. This multiple action grinds off burrs, hones smooth every piece in the load faster and more uniformly, the manufacturer claims. Speeds deburring, descaling, polishing on screw machine parts, stampings, castings. Available in 4 and 10 cu. ft. capacity.

Flyer will be sent by Hartford Steel Ball Co., Hartford 6, Conn.

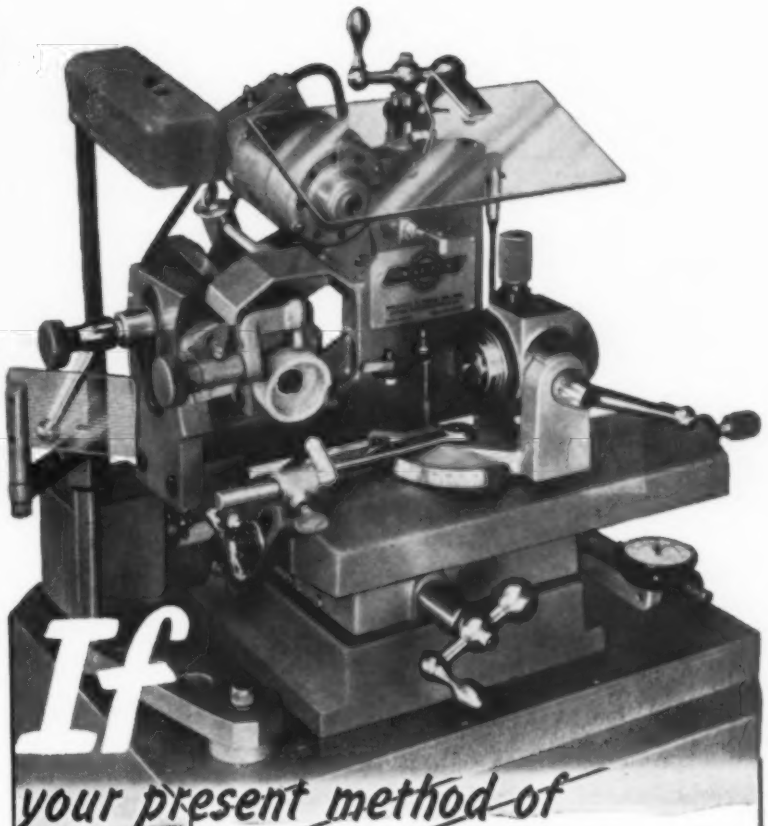
Use postpaid card. Circle No. 11

Contact Wheels and Rolls

Super-Grind contact wheels and rolls are each covered with synthetic, oil resistant rubber of specified durometer, vulcanized to a core to provide long service. Each is made to meet the requirements of its application — plain faced or with square or Carbo 61 serration.

Curtis Machine Div., The Carborundum Co., 1300 E. Second St., Jamestown, N.Y.

Use postpaid card. Circle No. 12



If your present method of sharpening small cutters is

..SLOW, INACCURATE, COSTLY—

GIVING POOR CUTTING EDGE AND FINISH—

CAUSING RUN-OUT IN SHARPENED CUTTERS—

CONSUMING TOO MUCH TIME CHANGING SETUPS—

TYING UP A LARGE EXPENSIVE MACHINE FOR SMALL WORK—

YOU NEED A END MILL CENTRA·POINT GRINDER ®

Centra • Point's 12 advanced features *really can* overcome all these problems by mechanically performing functions which are troublesome and time-consuming on standard grinders. For full details write today for Bulletin M-55.

Manufactured in Boston

WILLIAM H. FIELD CO., INC.

SINCE 1880

331 Dorchester Ave., Boston 27, Mass.

Use postpaid card. Circle No. 235

continued

Aluminum Products

Eighteen-page condensation of 1957 mill products catalog is intended as a convenient reference guide for preliminary discussion of design and fabrication considerations. New features include information on industrial foil and revised weight charts for wrought and casting alloys.

Selection guides for wrought alloys in sheet, plate and foil, wire rod and bar, tubing and pipe, extruded and structural shapes, and for casting alloys are also included, as well as helpful information on fabricating and finishing aluminum products.

Reynolds Metals Co., 2500 S. Third St., Louisville 1, Ky.

Use postpaid card. Circle No. 13

Slicing Machine

The Microtomatic slicing and dicing machine was designed specifically for the machining of brittle, shock-sensitive materials such as germanium, silicon, quartz, ceramics and carbides. Literature gives specifications for the three machine sizes now available. The MTA-6, having a work area of 6½" x 19", is most popular for slicing and dicing of semiconductor materials and quartz. The 8½" x 24" work area of the MTA-8 is used for abrasive and diamond wheel cutting of ceramics, carbides. The largest model, MTA-10, has a work area of 10" x 30" and the power needed for heavy duty work.

The DoAll Co., Des Plaines, Ill.

Use postpaid card. Circle No. 14

Comparators

Electrolimit comparators combine mechanical gaging with electrical magnification. In operation, the slightest mechanical movement of the gaging member "unbalances" an electrical circuit and size variations are shown greatly magnified on an indicating meter. The electrical circuit is extremely sensitive and accurate—there are no wearing or frictional parts to cause inaccuracies. Well-illustrated bulletin presents complete line.

Pratt & Whitney Co., Inc., Charter Oak Blvd., West Hartford 1, Conn.

Use postpaid card. Circle No. 15

Lapping, Washing Machine

For the proper cleaning of both plates and material, this company has combined a washing unit with its lapping machine. The Spiralap rotary lapping and combination wash unit Model No. SPL-2400 is supplied with a 220 volt, 3 phase, 60 cycle drive motor with magnetic switch. Other motor specifications are available.

The pump assembly is a 110 volt, single phase, 60 cycle compact unit and incorporates a mechanical seal. The tank and wash tray are combined as one unit for easy maintenance. A simple relap operation is automatically timed.

Leaflet from the Diesel Control Corp., Marine Pumps Div., 226 N. Marine Ave., Wilmington, Calif.

Use postpaid card. Circle No. 16

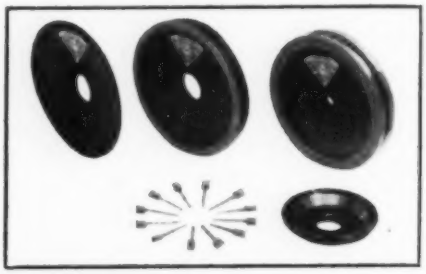
End Mills, Cutters

A 36-page catalog gives complete descriptions, specifications and list prices of end mills, Woodruff keyseat cutters, center reamers and combined drills and countersinks.

Fastcut Tool Co., 7405 E. Davison, Detroit 12, Mich.

Use postpaid card. Circle No. 17

LEADER IN THE DIAMOND WHEEL AND DEVELOPMENT FIELD



"Ace of Diamonds" brand diamond wheels your assurance of the best in high quality diamond wheels.

For longer life, cooler cutting and economy of operation, Ace of Diamond Wheels are the answer to your grinding problems.

Quality assured and maintained—through modern facilities and rigid standards.

Products of over 30 years experience

Manufacturers of:
Resinoid—Metal—Vitrified Diamond Wheels
Powdered Metals—Allied Products

TELEPHONE: CEnter 9-4602
THE PAUL L. KUZMICK COMPANY
271-279 GROVE AVENUE, VERONA, N. J.

Use postpaid card. Circle No. 236

Visual Grinding

Visual Grind, the projection grinding machine with continuous inspection, eliminates time-consuming changing of work from grinder to comparator. Precision optical system with matched lenses is claimed to deliver a trueness and definition equal to those of finest inspection equipment.

Machine has automatic table traverse, variable stroke and speed. It grinds numerous forms while using only a few select wheels, thereby reducing diamond and abrasive wheel costs.

Folder issued by the Cleveland Grinding Machine Co., 1669 Eddy Rd., Cleveland 12, Ohio.

Use postpaid card. Circle No. 18

Visual Control Systems

Visual industrial control systems providing a low-cost fingertip method for charting operational data are described in a 4-page illustrated bulletin (No. IC-1156). The four-color bulletin describes how systems reduce record keeping, increase efficiency by sight-recording complete set of facts to control production, scheduling, inventories, sales, etc. Data includes standard sizes, specifications and prices. Typical systems and construction features are shown.

Visi-trol Engineering Co., 9345 Hubbell, Detroit 28, Mich.

Use postpaid card. Circle No. 19

Automatic Feeders

Electronically controlled automatic feeders having large storage capacity are illustrated and described in Catalog No. 102-B. Models for all material flow needs. Inspection, hardness check, gaging, weighing, balancing, and special machines are also included in book.

Arlin Products, Inc., 13541 Auburn Ave., Detroit 23, Mich.

Use postpaid card. Circle No. 20

Abrasive Belt Machines For Flat Surfaces

Hill 2-roll vertical abrasive belt grinding and polishing machines for flat surfaces (wet or dry operations) are presented in four-page folder. Sheet, strip, and pinch roll types of machines are described. The 2-roll vertical head design is the same for all three types. This head covers basically a dynamically balanced upper steel idler roll and a lower rubber covered contact or work roll—over which the abrasive belt travels. The contact roll being the driving roll eliminates slippage of the abrasive belt, thereby increasing belt life.

The Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

Use postpaid card. Circle No. 21

Brazing, Processing Stainless

Catalog SD-24 entitled "Experimental and Production Brazing and Processing of Stainless Steel" describes and illustrates facilities and skills available to the user of parts fabricated of stainless steel, titanium and special alloys. Other photos show typical parts that have been successfully fabricated for aircraft, automotive and other industries.

Also contained in catalog are discussions of techniques and equipment employed for brazing and processing stainless steel, titanium and aluminum. Another section discusses low carbon coil steel annealing.

Stainless Processing Div., Wall Colmonoy Corp., 19345 John R St., Detroit 3, Mich.

Use postpaid card. Circle No. 22

Industrial Lighting

Brochure contains illustrated solutions to common industrial lighting problems. It shows how lighting was used to boost production in quality and quantity, improve worker morale and reduce the number of accidents.

Large Lamp Dept., General Electric, Nela Park, Cleveland 12, Ohio.

Use postpaid card. Circle No. 23

Tubular Screen Filters

Brochure describes operations of self-cleaning Filter-Matic tubular screen vacuum filter. Units are equipped with conveyor flights for the automatic removal of filtered solids from coolants, cutting oils, rolling oils, solvents. Flow capacities are 5 to 1000 gpm.

Industrial Filtration Co., Dept. FM-495, Lebanon, Ind.

Use postpaid card. Circle No. 24

Hammond
of KALAMAZOO
FOR
DEBURRING
ECONOMY

Model
50-DD

CONTACT WHEEL

IRREGULAR SHAPES

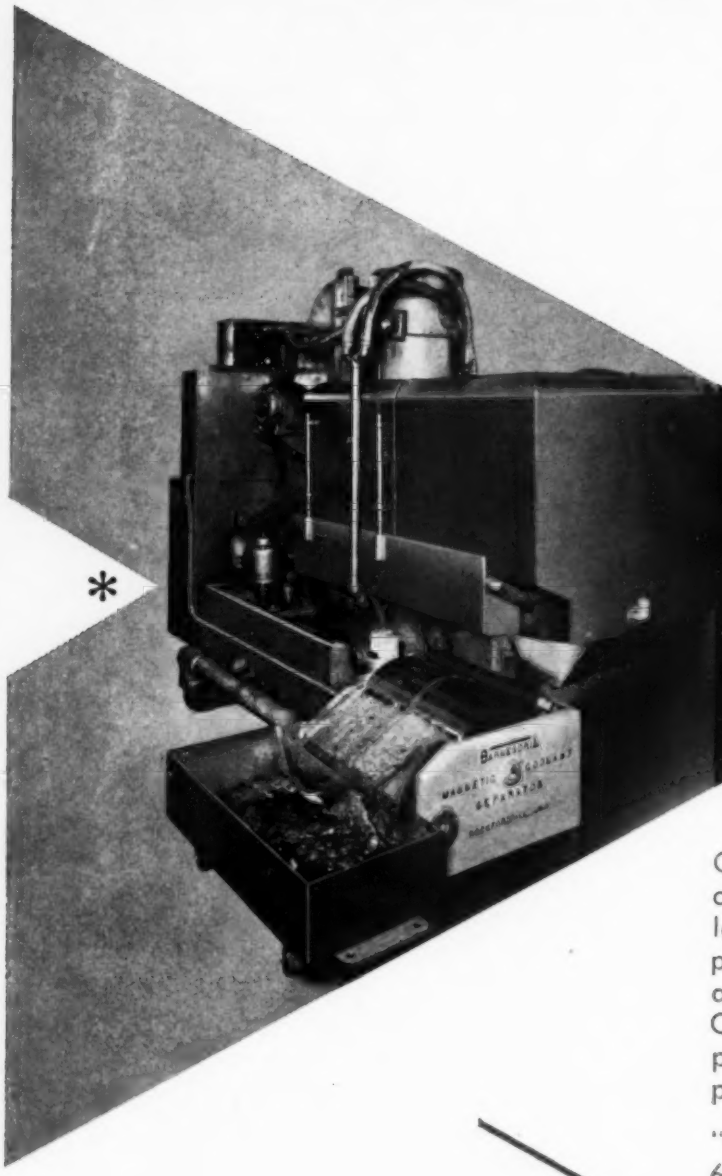
FLAT WORK

It is remarkable how soon these Abrasive Belt Machines pay for themselves in grinding, polishing and deburring.
11 combinations available with or without Duskolector.

"Clip" this ad to your letterhead. 20 page catalog will be sent at once.

Hammond Machinery Builders INC
1651 DOUGLAS AVENUE KALAMAZOO, MICHIGAN

Use postpaid card. Circle No. 237



*

CUT maintenance, labor costs

INCREASE PRODUCTION!

Coolant fed into a BarnesdriL magnetic coolant separator continuously circulates around the drum of powerful permanent Alnico magnets. Swarf, chips, and other ferrous particles are removed. Coolant is cleaned by the separator, thus preventing machine downtime and improving finishes.

a user reports:

"Our surface grinder (above) required 6 hours of cleaning and 5 gallons of coolant per week. With the BarnesdriL magnetic separator installed, there has been no downtime in 4 months and coolant used has dropped to 1 gallon per week. We cut our grinding costs $65.50 per week. Paid for the installation in less than 2 months."

These savings are typical. Call your BarnesdriL Factory Representative today or write for Catalog 3001H.

*BarnesdriL Magnetic Separator #4 installed on a Blanchard No. 18 Surface Grinder.

50th year

FILTRATION DIVISION

BARNES DRILL CO.

886 CHESTNUT STREET • ROCKFORD, ILLINOIS
DETROIT OFFICE: 3419 South Telegraph Road

Use postpaid card. Circle No. 238

Grinding and Finishing

New Equipment and Materials

For further information on any of the products listed here, use the handy postpaid card opposite page 96.

Vertical Electrospark Machine Announced by Ex-Cell-O

Performing machining operations on carbide and other tough materials that cannot be machined by conventional methods is achieved by Ex-Cell-O's application of the Method X process to its new Style 243-6 Vertical Electrospark Machine. This machine will pierce, drill, trepan, tap or sink a cavity in any material that is an electrical conductor. Its prime function is for machining hard metals or forming special shapes that would be otherwise difficult to produce.

Ex-Cell-O vertical electrospark machine for hard material machining.

Applying the electrospark principle of machining to a mechanical unit, Ex-Cell-O's style 243-6 Machine is capable of positioning and holding the work, and feeding the tool to perform the desired operation. The work table is mounted on slides so that the work can be positioned under the tool. Because the cutting action of the Method X process creates no tool pressure on the part being machined, only sufficient clamping pressure is required to make a good electrical contact.

Operation-wise, the Method X machine accomplishes metal removal by the utilization of a positive electrode, or workpiece, and a negative electrode or tool, energized by a high amperage electrical current. In this electromechanical process, electrical impulses pass between the tool and work, which are submerged in a dielectric bath. When the tool and work are brought in close proximity, controlled impulses remove particles of the work to form an inverse image of the tool. At no time does the tool actually touch the work. The particles acted upon are ejected and washed away by the circulating fluid, leaving tiny crater-like depressions in the work, which is characteristic of electrospark machining. The cycle is repeated many times per second, with each successive electrical discharge producing a crater, until these blend into a nearly smooth finished form. The resulting surface possesses a uniform matte type finish.

In addition to machining hard materials such as carbides, the Ex-Cell-O 243-6 machine will cut a variety of regular and irregular shapes.

Tools used for the Method X process can be made from low-cost sheet brass, tubing or rod, depending on the operation to be performed or the shape required. Steel or other conductors may also be used for tool material.

Ex-Cell-O Corp., Detroit, Mich. •

Use postpaid card. Circle No. 101

DoAll Announces Parallel Lapper

Quick set up and ease of operation are claimed for the new parallel lapping machine developed by DoAll. The company has used special lapping machines to manufacture gage blocks. Now these machines, together with lapping compounds, work holders and monochromatic light inspection equipment, are available to industry for the production of flat, parallel surfaces. Surface finishes to .09 microinch and dimensions held to one millionth of an inch are said to be obtainable in production quantities.

Variable speed drive gives optimum rate for each phase of the lapping operation. No longer must roughing cuts,

DoAll parallel lapping machine.

continued

conditioning laps and other fast lapping jobs be penalized by the fixed speed range of the standard lapping machine. The drive provides infinitely variable speeds of from 10 to 50 RPM of either the lower lap or the work holder in both directions. The speed is shown on a tachometer in the machine column. Wide range provides the slow speeds needed for thin and fragile materials and pieces having small surface areas, as well as the high speeds required for roughing large pieces, for nonferrous lapping and for conditioning the laps.

The lower lap is stationary with the work holder rotating for most flat lapping; however, for cylindrical lapping and conditioning the laps, it is desirable to rotate the lower lap. This is quickly accomplished in the DoAll Parallel Lapping Machine by simply engaging a pin in a socket.

Shallow catch pan designed for easy cleaning.

Attention has been given to accessibility of the operating parts and to the reduction of error causing operator fatigue. Swinging the upper lap aside for frequent inspection during the lapping process is facilitated by antifriction bearings in the overarm assembly.

Similarly the lower lap assembly and catch pan have been designed to reduce non-productive time. The catch pan is shallow and the lower lap may be lifted out. This not only facilitates cleaning and making setups but virtually eliminates the trouble encountered retrieving small parts that are dropped when loading or unloading.

Laps are special stabilized alloy iron 16" diameter with 4" faces, either plain or serrated. Mineral laps are available for nonferrous materials. The capacity of the machine for flat work is 5" high by 5" wide by 5" long; for cylindrical lapping, 5" diameter by 5" long. Work holders are available for all jobs within that range, and are rotated in a scientifically developed irregular path.

The DoAll Company, Des Plaines, Illinois, U.S.A. •

Use postpaid card. Circle No. 102

Wesson Tool Grinder

An improved model of the Poweramic grinder has been announced by Wesson Company, Detroit. Designed to produce hone-like finishes on cutting tools with practically no skill on the

ARTER Convertible
Internal-Cylindrical
GRINDER

This versatile production or tool room grinder can be used as prime equipment or as an auxiliary to larger machines.

Dual purpose — Internal or Plain Cylindrical — by simply changing wheelheads. This low-priced grinder, designed for work where small-in-capacity machine is needed, is proving an exceptional investment for many grinding operations.

It will do the same for you.

ARTER GRINDING MACHINE COMPANY
WORCESTER 5, MASSACHUSETTS
Jigmatic Automatic Tape Controlled Positioning Table • Rotary Surface Grinders
Flat Circular Cutter Grinders • Internal Grinders • Cylindrical Grinders • Carbide Tool Grinders
AGENTS IN INDUSTRIAL CENTERS OF UNITED STATES AND CANADA

Use postpaid card. Circle No. 239

part of the operator, the improved model has simplified and more accessible controls. Tool grinding time is also reduced. Improved finish and reduced diamond wheel cost are attributed to Wesson's Tru-Arc grinding principle. •

Use postpaid card. Circle No. 183

Traveling Head Buffer

A new Traveling Head for buffing work, known as Model 50-108, has been introduced by Hammond Machinery Builders.

This new head travels with the work, providing more buffing time on areas that are difficult to reach. It can be used on straight-line conveyors and on certain continuous rotary automatic applications. As the work approaches the wheel, an air cylinder is energized for forward stroking variable up to 5". At the end of the stroke, the air cylinder

Hammond Traveling Head Buffer used with straight-line or rotary conveyors.

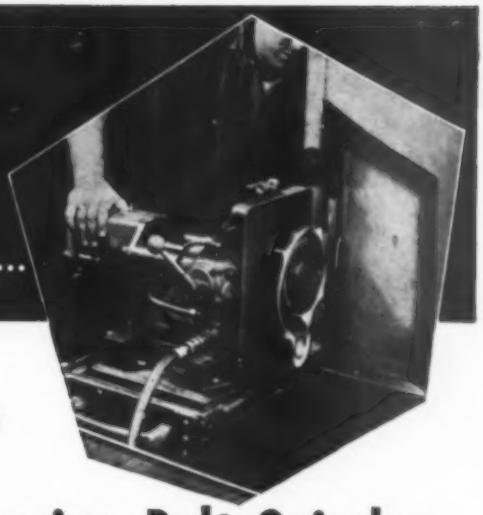
returns the head to pick up the next piece of work. The speed of travel can be synchronized with the conveyor speed through a hydro-check cylinder which is also used to provide smooth forward movement.

A dovetail way provides horizontal adjustment and a handwheel is used for vertical adjustment of the column. Head can be rotated 360° around column and is readily positioned to the work. It can be used with buffs, set-up wheels, abrasive belts, and wire or tampico brushes. V-belt drive for 3, 5 and 7½ HP motors can be supplied for any popular spindle speed.

Hammond Machinery Builders, Inc., 1614 Douglas Avenue, Kalamazoo, Michigan. •

Use postpaid card. Circle No. 104

When shape and inaccessibility makes flat-surface machining of pump housings difficult...



Graymills Corp. cuts costs dramatically with an

Engelberg Abrasive Belt Grinder

The shape of the intake-discharge housing on a Graymills immersion pump makes it unsuitable for surface milling or turning on a lathe. When either method is used, pump leakage results in as much as 10% of production runs, requiring corrective machining that pushes unit costs up.

Graymills installed an Engelberg platen type abrasive belt grinder, equipped with an automatic infeed table. To this machine (the BG8-FT9 described below) Graymills attached a draw-bar air fixture developed by their own engineers, designed to handle several sizes of castings with short run flexibility and minimum setup time.

Grinding rates on the grey metal pump castings are now considerably faster than alternative methods, in spite of a 1/32" stock removal. Very satisfactory belt life is obtained with 24-grit silicon carbide running at 5,000 s.f/m., cooled by a water-soluble chemical.

In the Graymills experience, Engelberg abrasive belt grinders again prove their adaptability to specific needs . . . adaptability that is limited only by the ingenuity of the engineers who program its use.

Solution to Graymills' Problem: the BG8A-FT9 Designed for Mass Production

● Fast machining by wet or dry abrasive belt, backed by ground steel platen. Presetting controls rate of feed and pressure. Quick approach of ball-bearing table is followed by slower, hydraulically controlled infeed down to Micro-Stop limit. Does fine tool room jobs of surfacing, squaring, grinding angles, bevels, radii, etc.

For complete information on this and other Engelberg Abrasive Belt Grinders, write . . .

The ENGELBERG HULLER Co., Inc.
325 Seneca St., Syracuse, N. Y.

ENGELBERG
Precision **ABRASIVE BELT GRINDERS**

Use postpaid card. Circle No. 240

continued

Packaged Automatic Size Control Units

Automatic size control, automatic gaging, and automatic inspection and classifying can now be added to standard machines by standard systems made up of combinations of seven standard components developed by Cargill Detroit Corporation, Birmingham, Michigan. These are not delicate laboratory systems, but rugged products of machinery builders for machinery applications.

It is possible to include these systems in new machines being built, or to add them to machines already in service.

A typical application of a system to a through feed centerless grinder includes a meter type size indicator, transducer head of comparator type for size control, servo motors, electronic classifier for operating reject gates and shutoff, and magnetic power amplifier which provides amplification to preamplifier output sufficient to drive servo motors.

Cargill Detroit Corp., Birmingham, Mich. •

Use postpaid card. Circle No. 105

"most used grinder" say customers

WET or DRY Model MG

In checking with the tool, die, gage and general production shops that use SANFORD SURFACE GRINDERS, the most frequent comment was that Sanford Grinders were the "most used" of any grinders in the shop.

Others have tried to copy but there's a "feel" that comes from the precise individual quality and workmanship that goes into every SANFORD GRINDER. It's the factor that can't be found in any other grinder.

So widely used you can ask users in your own area how they like the low priced Sanford Surface Grinder.

PARTIAL SPECIFICATIONS—

Capacity — 8" x 12" x 12".
Table travel — 13", traverse 8¾".
Vertical clearance 12" under 7" wheel.
Standard grinding wheel — 7" x ½", 1¼" hole.
Spindle speed approx. 3000 RPM.
Motor, ½ HP, single or 3 ph., dynamically balanced.
Floor space — 45" x 38" x 62" high.
Net wt. with stand approx. 630 lbs.

Write for illustrated and fully descriptive literature, reconditioning facilities, optional equipment and prices.

Representatives in major industrial areas

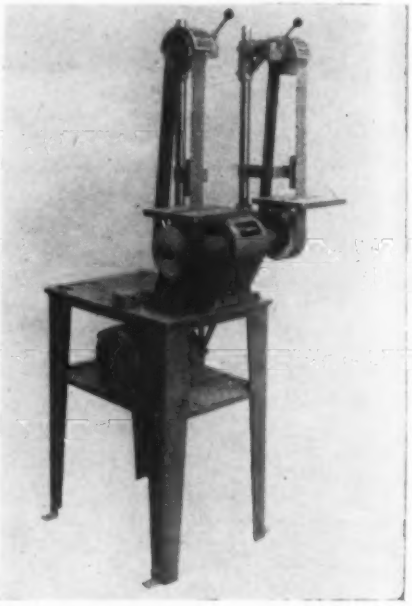
SANFORD MANUFACTURING CORP. 1026G Commerce Ave., Union, N. J.

Use postpaid card. Circle No. 241

Combination Belt Grinder

The Hammond Special Model 50 Combination Abrasive Belt Grinder offers low cost grinding, polishing and deburring. It is also the answer to eliminating costly hand-filing and troublesome finishing of contour, inside and hard-to-get surfaces that cannot be reached by regular wheels.

All the various methods of employing abrasive belts are available . . . free belt, contour, plate and contact wheel. Recommended for ferrous and non-



Hammond combination belt grinder.

ferrous metals, as well as plastics, ceramics, wood, rubber, glass, etc.

Each abrasive belt can be used in the vertical or the horizontal position. Abrasive belts from ½" to 2½" wide are used and from 42" to 60" long. V-belt drive from 1 HP or 2 HP motor. Can also be furnished with built-in dust collector requiring no additional floor space.

Hammond Machinery Builders, Inc., 1614 Douglas Avenue, Kalamazoo, Michigan. •

Use postpaid card. Circle No. 106

Permanent Magnet Chuck

O. S. Walker has announced a line of multi-pole fine division permanent magnetic chucks. The chucks are designed to meet industry needs for a permanent magnetic chuck with fine pole division equal to characteristics of electro-magnetic chucks. This is done

by the use of ceramic magnetic material.

The chuck is made in three sizes: 6 x 10½, 6 x 12½, 6 x 18½, with heights of 2⅛, 2⅛, and 2⅜ inches, respectively. Other sizes will be in production later.

O. S. Walker Co., Inc., Worcester, Mass. •

Use postpaid card. Circle No. 107

Finisher for Cutlery Industry

Clair Manufacturing Co. announces their Model 402 standardized glazer and mirror finisher for the cutlery and related industries. This model, developed in collaboration with leading cutlery experts, meets all requirements for any surface finishing operation on blades or handles, flat or contoured—and it can be converted to an "Edger" in a few seconds. As a standard unit, it is available at a volume "package" price.

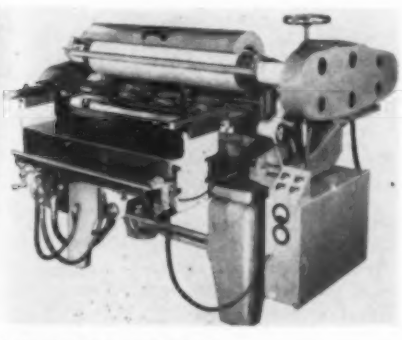
Model 402 places strong emphasis on safety and efficiency. Body contact with the emergency bar simultaneously opens rolls, cuts motors and arrests all actuations. The work rack serves as a foolproof operating control. When withdrawn, the rolls open automatically; when properly and safely replaced in guide-ways, they close again. Any failure of the safety circuit forstalls the closing action.

Safety has been emphasized in the application of bar compound. Horizontal design assures maximum efficiency with minimum operating fatigue; 40" waist level loading requires no back bending, but allows perfect visibility and exceptional cleanliness. The rolls can be changed in two minutes; they float against controlled air pressures, ready to withstand forced opening without damage.

Sensitive air floating action of rolls assures uniform contact pressure regardless of taper. The rolls are open as the work is placed in the machine. This makes the Model 402 excellent for blades, which are in motion as the rolls automatically close and contact them. Predetermined maximum contact pressure can be applied without fear of localized burning or damage to blade tips.

Clair Mfg. Co., Inc., Olean, N.Y. •

Use postpaid card. Circle No. 108



Clair finisher and glazer.

Leveling Jack

Style JS leveling jack is offered by Enterprise Machine Parts Corp. for easy leveling of machine tools, assembly fixtures, surface plates and other industrial equipment.

The jack safely supports up to twenty tons and raises or lowers easily by means of the adjustable nut. Compensation for floor slope is made by a concave spherical radius in the lift screw and aligning disc which provides adequate "float" and maintains horizontal alignment of the equipment.

Machine vibration and creepage are minimized through the use of special mounting pads—eliminating the need for anchor bolts on many installations. Available in 12 models, ranging in height from 1¾" to 3¾". Leveling adjustment ⅜".

Enterprise Machine Parts Corp., 2731 Jerome Ave., Detroit 12, Mich. •

Use postpaid card. Circle No. 109

Get America's Finest Precision GRINDER

- air turbine drive—always runs cool
- guaranteed 75,000 RPM at 1/6 HP—holds speed under load
- weighs only 12 ounces—overall length to chuck only 5-1/2"
- precision built for trouble-free, continuous operation
- balanced rotor, runs vibration free

NOW TRY IT YOURSELF ON YOUR OWN WORK ON A FREE 10 DAY TRIAL WITHOUT ANY OBLIGATION

ONCE YOU TRY THIS GRINDER we're sure you wouldn't sell it for THREE TIMES its PRICE!

Until you try this Onsrud air turbine grinder, you'll never know what a grinder can really be like. Gives actual 75,000 RPM speed, control and ease of handling. Totally different than any grinder made today. That's why we invite you to try it on a 10 day FREE trial. For light deburring, flash removal, finish die grinding and polishing, tool mounting and related operations, you'll find it's the best you ever used. Precision built . . . no motor to burn out. Over 10,000 already sold for industrial use. Send coupon below.

Onsrud® MACHINE WORKS INC.
3945 PALMER STREET • CHICAGO 47, ILLINOIS

There's No Obligation to Buy!

SEND THIS COUPON

Just fill out coupon below, or write on your company letterhead for COMPLETE INFORMATION ON B1B GRINDER FREE 10 DAY TRIAL PLAN.

YOUR NAME_____

COMPANY NAME_____

DEPARTMENT_____

STREET ADDRESS_____

CITY_____ ZONE____ STATE_____

Use postpaid card. Circle No. 242

MURRAY WAY "PROVED RIGHT" EQUIPMENT AND ENGINEERING EXPERIENCE ARE THE ANSWER TO YOUR POLISHING, BUFFING AND GRINDING NEEDS.
Whether you need a single, standard polishing head or a specially engineered, fully automatic production line with all the trimmings, Murray-Way can do the job better, more reliably, for greater operating efficiency.
You are invited to consult our engineering staff about your finishing problems.
MURRAY WAY CORPORATION
P. O. BOX 180, MAPLE ROAD EAST BIRMINGHAM, MICH.
Polishing, Buffing, Grinding, Filtering Equipment that automatically cuts your costs.

Use postpaid card. Circle No. 243

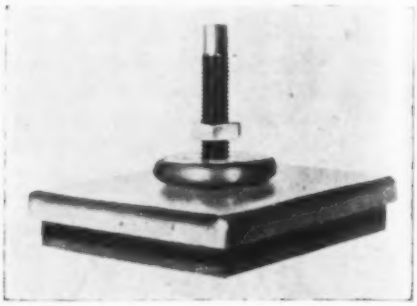
New Equipment

continued

Self-Leveling Machine Mount

A new self-leveling machinery mount, called the Level-Rite, has just been announced by the Unisorb Division of The Felters Company. It consists of an all-steel base unit with leveling screw and leveling plate, combined with a Unisorb vibration-dampener pad.

The Unisorb mount is designed in seven models with loading ranges from



Level-Rite self-leveling machine mount.

800 to 7500 pounds per unit; and in four sizes: 4″ x 4″, 6″ x 6″, 8″ x 8″, and 10″ x 10″. One unit is required for each machine leg or mounting point.

Level-Rite is said to have two special features: An exclusive Screw-Post Design by which a machine is quickly and easily leveled and new compression anchoring. The only action required is rotation of the square top of the screw post to bring machine to level position, then securing lock nut. Second advantage is the ease of anchoring. No bolts, lag screws or cement are needed. Level-Rite eliminates need for anchor bolts or screws; it is designed so compression provides positive hold.

The Felters Co., 210 South St., Boston 11, Mass.

Use postpaid card. Circle No. 110

MODULE BENCH AND STORAGE SYSTEM enables user to construct work stations, storage areas and workbenches from standard components. Bathey Mfg. Co., Plymouth, Mich.

Use postpaid card. Circle No. 111

Vibration Tester

A new portable self-powered vibration testing instrument will enable companies to set up routine programs of seeking out vibration and establishing acceptable tolerances in production, inspection and maintenance, according to the manufacturer, International Research & Development Corp., 797 Thomas Lane, Columbus, Ohio.

The new instrument, called the Model 305 Portable Vibration Amplitude Meter, is available now after more than two years of research and field testing. Design and application have been simplified so that those otherwise inexperienced with vibration problems can use it after short instruction.

Light weight of the instrument makes it convenient for use in inaccessible places. It is operated on either "A" or "B" Mallory or Ever Ready batteries.

Applications for the new IRD Model 305 include three major categories: inspection, production and preventive maintenance.

One of the biggest applications is for machine tool maintenance. For example, acceptable vibration tolerances are established for the machine tools to assure production within specified tolerances of finish and dimension. Routine inspection is made of the machine tools, vibration level recorded, and when excessive vibration is present, other IRD Analyzing equipment such as the Models 300, 400 or 652 Analyzers are used for further analysis and correction of the vibration, without costly dismantling of the equipment.

Portable vibration testing instrument.

International Research & Development Corp., 797 Thomas Lane, Columbus, O. •

Use postpaid card. Circle No. 112

the **BIG** difference
in DIAMOND WHEELS

BOND... the big reason why diamond wheels by J. K. Smit meet your requirements

EXPERIENCE... gained from many years of testing cementing mediums and fillers

QUALITY CONTROL... that insures even distribution of diamond particles throughout every wheel

ONE SOURCE... that manufactures all types of metal, vitrified and resinoid bond diamond wheels

Your copy of Catalog #54 is awaiting your request. Call us direct on any standard or special application

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HOME OFFICE AND PLANT
MURRAY HILL NEW JERSEY
DETROIT: TORONTO, CANADA

Additional plants in London, Paris, Amsterdam and Toronto, Canada

Use postpaid card. Circle No. 244

continued

Constant Level Oiler

Constant level electro oilers offer an effective means of precision lubrication. Conventional gravity feed oilers have a slight change in the rate of drop feeding from a full reservoir to an empty reservoir. This change in drop feeding is caused by the variation in oil level in the reservoir.

The constant level electro oiler eliminates any variation in drop feeding since the oil which feeds the sight feed valve is always at the same level. This level is maintained in the base of the reservoir. Its operation is based on the liquid seal principle.

Unit can be supplied with single or multiple sight feed valves for individual flow to each bearing. Up to 24 sight feed valves can be separately adjusted and settings retained by means of a friction screw. Drop feeding of oil to widely separated bearings is controlled and observed from one central point. This makes it possible to have one constant level electro oiler replacing up to 24 individual oil cups, gaining the advantage of automatic operation.

Oil-Rite Corp., 2302 Waldo Blvd., Manitowoc, Wis.

Use postpaid card. Circle No. 113

High-Capacity Coolant Pump

Designed to supply coolant from minimum to 3000 gallons per hour, Model 7500A-T Brady pump and tank unit is completely self-contained and can be employed equally well for permanent or portable use.

Mounted on a heavy-gauge steel tank with built-in baffle that eliminates chips

Brady coolant pump for permanent or portable use.

from the coolant stream, heavy-duty pump is driven by ⅛-hp, 3450-rpm, 110-v, 60-cycle, single-phase electric motor. Same unit is available also, powered by 220-440-v, 3-phase electric motor when required.

Built-in switch, 6-ft. industrial type electric cord and two 6-ft. heavy-duty hoses with suitable valve and nozzle are included as a part of the package.

Rectangular coolant tank is painted machinery green inside and outside and is equipped with convenient handles for emptying or carrying.

The Model 7500A-T Brady pump and tank is the largest of the Brady line of package coolant supply units and is adequate to supply small, medium and large machine tools. Amount of coolant fed to machine is easily controlled by adjustment of valve at nozzle.

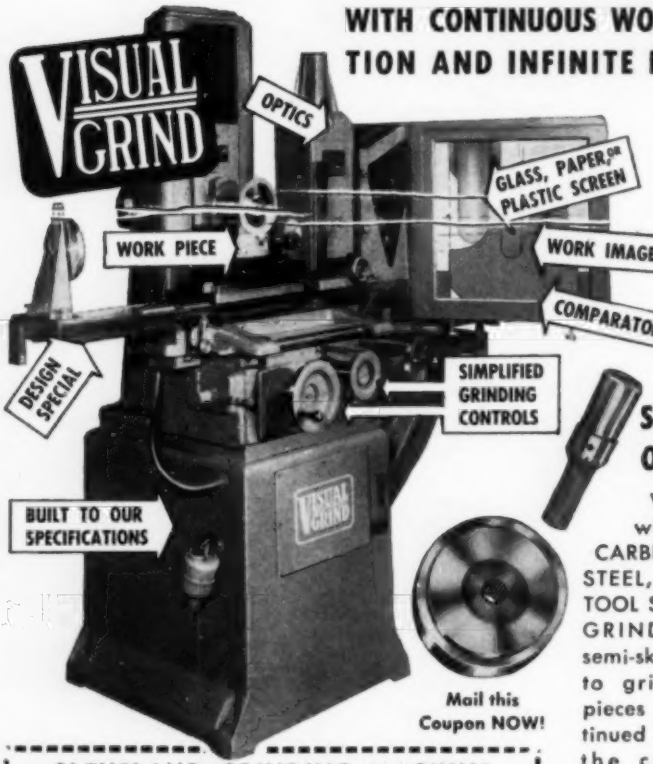
Brady Pump Corporation, 1001 East 18th Street, Muncie, Ind.

Use postpaid card. Circle No. 114

TOP FIRMS SHOW

PROVED SAVINGS UP TO 75%

IN SET-UP AND GRINDING TIME WITH CONTINUOUS WORK INSPECTION AND INFINITE PRECISION



SIMPLIFIED OPERATION

When working with TUNGSTEN CARBIDE, STAINLESS STEEL, STELLITE or TOOL STEELS, VISUAL GRIND permits a semi-skilled operator to grind precision pieces without continued checking with the comparator. Automatic inspection is accomplished with the built in optical comparator.

Visit our plant . . . let us show you how VISUAL GRIND will speed production — cut costs.

Mail this Coupon NOW!

CLEVELAND GRINDING MACHINE
1660 Eddy Road Cleveland 12, Ohio

Gentlemen:

☐ Please have your representative call at our plant. The most convenient time would be (week) _____

☐ Phone for appointment

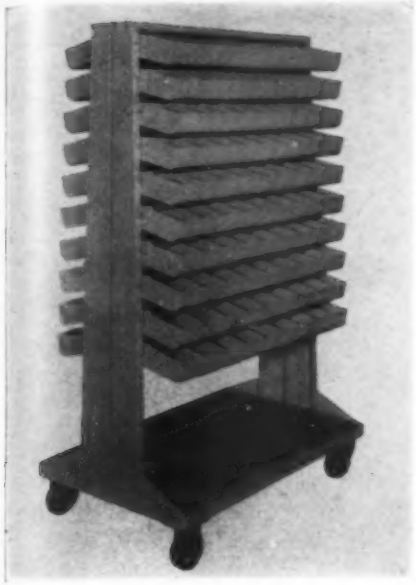
☐ Please send us complete information on the new VISUAL GRIND.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

Use postpaid card. Circle No. 245



Portable Small Parts Storage Units

New portable small parts bin unit featuring a wheeled dolly is available from Bathey Manufacturing Company, Plymouth, Michigan.

Unit is useful for service, maintenance, repair and certain assembly operations where it is advantageous to move the parts to and from the job. Bin boxes hang on rails allowing 100% visibility and easy accessibility to box interior, yet presents a neat appearance.

Offered with five sizes of removable bin boxes, 6" front to back, 2¾" deep and widths from ¾" to 11⅛". Dimensions of the frame of the unit shown are 24" wide x 36" long x 62" high.

Bathey Mfg. Co., Plymouth, Mich.•

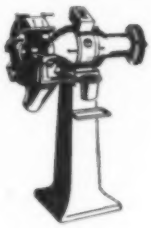
Use postpaid card. Circle No. 115

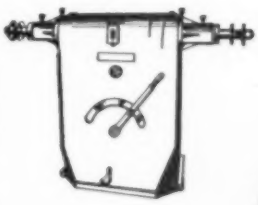
PROPELLER BLADES RECEIVE MATTE FINISH in special liquid honing machine at Trans World Airlines' new $25 million overhaul base near Kansas City, Mo. Fine silica abrasives, suspended in liquid medium, are shot in stream against blade, giving it velvet finish. Process removes small nicks received in service. Machine is made by Vapor Blast Mfg. Co., 3025 W. Atkinson Ave., Milwaukee 16, Wis.

Use postpaid card. Circle No. 116

GRINDERS . . . BUFFERS

BUFFERS— Direct, belt, gear, vari-speed





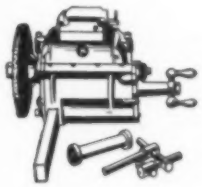
These superb electrical grinders and buffers . . . 1/3 to 40 hp . . . set the pace for highest quality and efficiency . . . and for amazing savings in cost and maintenance. Preferred by industry everywhere!

ATTRACTIVELY PRICED

United States Electrical Tools

Over 60 years of Service to Industry

GRINDERS— Lathe, tool post, angle plate, vertical spindle



GRINDERS . . . BUFFERS

United States Electrical Tools are electrically and mechanically correct.

ALL ROTATING PARTS AND SPINDLES ARE PRECISION-BALANCED DYNAMICALLY BY LATEST ELECTRONIC EQUIPMENT

WRITE FOR CATALOGS

Welcome to the AFS Castings Congress and First Engineered Castings Show at Cincinnati, May 6 to 10. Come and see us at our plant!

The United States Electrical Tool Co.
3640 LLEWELLYN ST., CINCINNATI 23, OHIO

Use postpaid card. Circle No. 246

continued

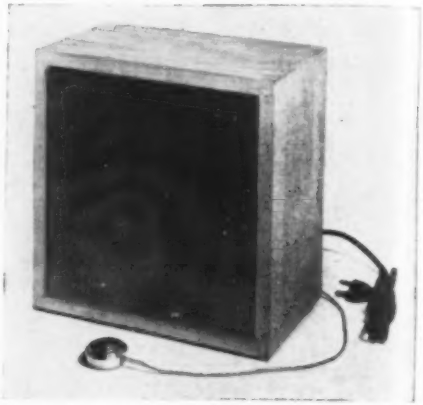
Industrial Hi-Fi

Aer-O-Matic Tool Co. now offers an Industrial Hi-Fi amplifying system that can be attached to any grinder to amplify the dressing sound. It is beneficial on machines where the dressing equipment is enclosed and very difficult to hear, or in noisy shop locations.

The hi-fi pickup unit is attached to the machine's dressing mechanism, either to the slide or bar giving an operator close control on dressing. The hi-fi takes the guesswork out of any close tolerance dressing operation and is so sensitive that removal of .0001 of abrasive is very audible. It will also tell the operator when the wheel has sparked out.

The industrial Hi-Fi amplifier can also be used in grinding to pick up the sound of the grinding wheel coming in contact with the work and when spark out has been accomplished, by attaching the pickup to the tail stock center on center grinders, to the work rest blades on centerless grinders, magnetic chucks on surface grinders.

The industrial Hi-Fi can be used in many ways in industry other than wheel dressing where sound is a predominant factor. It can indicate load on a machine, it can be attached to cutting tool holders or work holders to indicate the tool getting dull so they can be removed and resharpened before they are damaged and a lot of stock has to be removed to restore the tool, shortening the tool life.



Industrial hi-fi outfit for wheel dressing, etc.

Other uses for industrial Hi-Fi are in assembly operations. In maintenance departments to detect trouble in machines simply by attaching a prod to the pickup and touching any spot where trouble may be, such as bearing housings, etc.

Aer-O-Matic Tool Co., 5059 W. Diversey Ave., Chicago 39, Ill. •

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FOR LOWER SNAGGING COSTS

ATLANTIC

"Job-Mated"

GRINDING WHEELS

Time and again snagging costs have been reduced by the following ATLANTIC ABRASIVE formula: (1) a thorough analysis of specific snagging operations; (2) "mating" the grinding wheel characteristics to the job requirements. Equally important . . . ATLANTIC ABRASIVE representatives thoroughly understand the factors involved in snagging operations such as the structural differences in metals, even in the same metal; the quantity of stock to be removed; and the most effective combination of such factors' requirements to produce the desired results.

RESULTS Because ATLANTIC Resinoid-Bonded GRINDING WHEELS are "job-mated," they have a smooth, floating action that requires less pressure, thereby reducing operator fatigue, and they cut cleaner, faster and run cooler on job after job . . . reducing costs to a minimum. Prove it for yourself. Call your nearby ATLANTIC representative or write direct. Atlantic Abrasive Corp., 532 Pearl St., South Braintree, Mass.

A complete line: everything you need for roughing, finishing, and polishing including mounted wheels and points and depressed center wheels.

ATLANTIC ABRASIVE CORP.

South Braintree 85, Massachusetts

Use postpaid card. Circle No. 247

New Safety Spectacles

New industrial spectacles known as Magnasite have been introduced by the American Industrial Safety Equipment Company, Cleveland. These spectacles feature an improved design of square shape lenses which provide a larger viewing area. Frames are clear plastic, with spatula temple . . . are lightweight yet impact resistant.

Available in four lens sizes and four bridge sizes. Choice of clear or green hardened glass lens or clear or green "Amerilite" lens. Clip-on-side-shields are also available.

American Industrial Safety Equipment Co., 3500 Lakeside Ave., Cleveland 14, O. •

Use postpaid card. Circle No. 118

Carbide Tool Grinder

Coolie-Grinderlap single point carbide tool and carbide drill grinder has a 6" 60 grit roughing green wheel and a 6 inch re-lod-able diamond finishing wheel, 325 screen, mounted on opposite ends of the motor shaft. A new "coolie" ring, through efficient wheel coolant distribution, gives a 20° reduction of temperature of the tilted worktable and at the work face of the rough grinding wheel by actual thermometer test. In room temperature of 75°, a 55° temperature was recorded at the point of grind with a water feed of 1 drop every ten seconds into the coolie ring. Water is introduced at the back of the wheel by gravity feed—thence through eight ⅛ inch holes from the groove through the metal back of the cup grinding wheel and thence by centrifugal force out to the work surface of the wheel. The limited amount of the water used is conserved and prevented from leaking through the stone structure of the wheel by a sealed coating on the inside face of the cup emery wheel.

Diamond Tool Co., South Haven, Mich. •

Use postpaid card. Circle No. 119

Surface-Cleaning Process for Copper

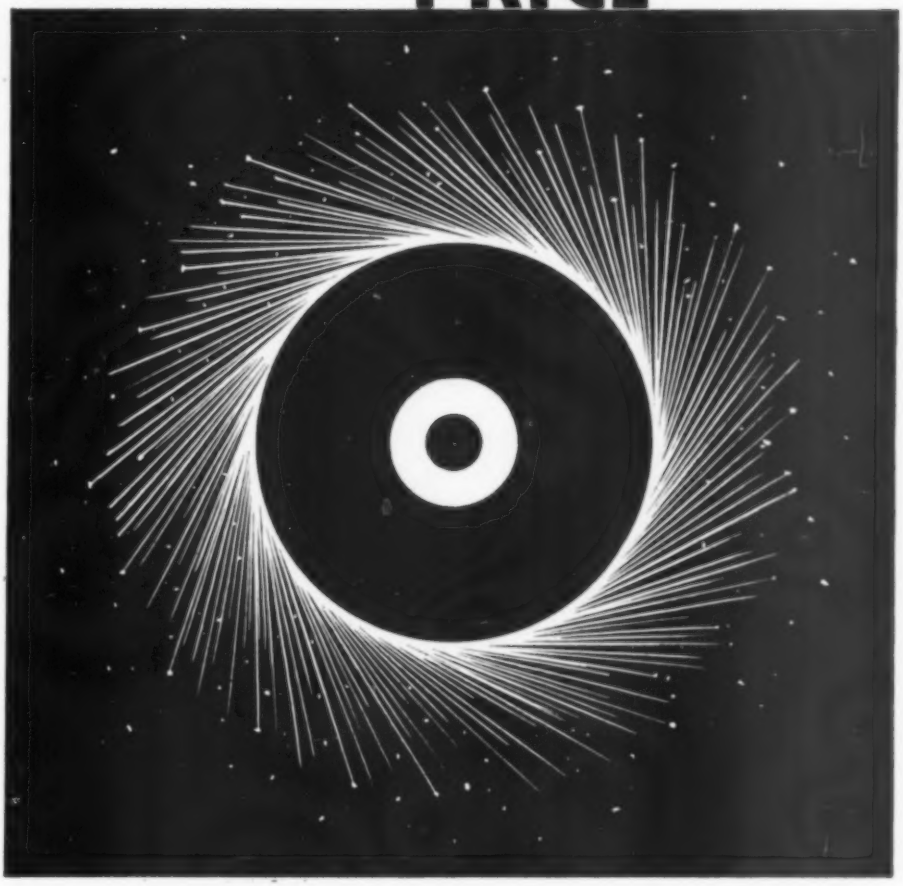
A new surface-cleaning process for copper—both rolled and drawn products—which greatly improves its bonding properties and delays retarnishing, has been developed by Becco Chemical Division, Food Machinery and Chemical Corporation.

Instead of the usual acid-pickle, the new Becco process employs a safer and more easily handled water-solution of ammonium persulfate at room temperature, in which the copper is given a 30-second dip. Surface films are completely removed, a slight etch is imparted to the surface, and re-tarnishing is considerably retarded.

Becco Chemical Division, Food Machinery and Chemical Corp., Station B, Buffalo 7, N.Y. •

Use postpaid card. Circle No. 120

RECOVERED DIAMOND DUST SOARS TO RECORD PRICE



Recent tests prove Torit Dust Collectors can recover up to 37% of diamond chips

Due to the rapid increase in industrial diamond value, bort (recovered diamonds) has reached a record high price. It is becoming more and more important to recover diamond chips broken off during grinding and finishing operations. In recent on-the-job tests conducted at one of the nation's largest manufacturing plants, Torit Dust Collectors recovered 37% of bort from 100 mesh wheels. Average recovery from all sizes of wheels was 20%. The recovery of the bort alone soon paid for the Torit units.

Torit Collectors have a higher recovery rate than any other dust collector because of their stronger suction and *cloth filters*. This filtering cloth stops diamond particles better than any other filter known. Furthermore, the valuable material is caught on the *outside* of the filters—none of it is lost in the filter itself. Why not discover how much money Torit Dust Collectors can save you in diamond salvage, while giving you cleaner, more productive work areas.

For complete information, send for new free handbook.

TORIT MANUFACTURING COMPANY

Dept. 513 • 311 Walnut Street • Saint Paul 2, Minnesota

Use postpaid card. Circle No. 248

continued

Universal Sorting Machine

Sorting anything from bearing balls to gears and piston pins into as many as thirteen size categories is now possible on the E. A. M. "Autosorter." The Autosorter is based upon a new no-drift electronic principle of gauging plus a simple mechanical "memory" system. The same machine can be used for increments anywhere from ten millionths to ten thousandths.

Accuracy between classes is guaranteed as low as .000002." The speed range averages around 10,000 pieces per hour, depending upon the size and type of the piece.

For changing to different types of work pieces, the top portion containing the mechanical feeding and positioning elements is removed and replaced in 5-10 minutes by means of three cap screws.

For visual inspection of balls and rollers, a stroboscopic light in window indicates out of roundness.

The equipment is compact and portable. Requires practically no maintenance.

The price is claimed to be considerably lower than the cost of present precision sorting equipment systems.

EAM Division, Industrial Gauges Corp., West Englewood, N.J. •

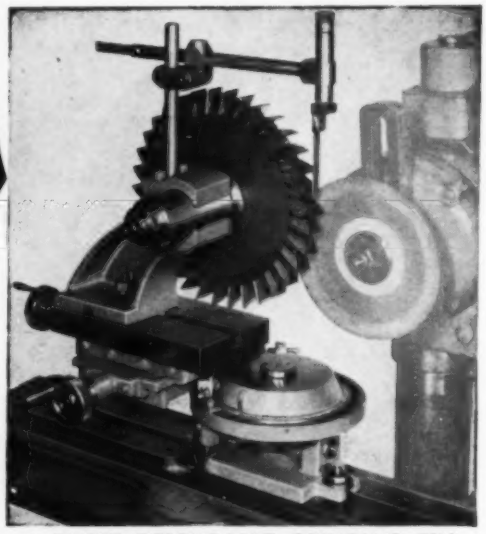
Use postpaid card. Circle No. 121

"Autosorter" gages and sorts parts at high speed.

THE UNIVERSAL RADIAL CUTTER GRINDING FIXTURE

Does 5 Operations without removing cutter from its ARBOR!

On cutters up to 8" in diameter, the No. 6 fixture, as shown with our No. 6A heavy-duty, right-angle, ballbearing spindle workhead:
Sharpens side teeth on **both** sides.
Sharpens peripheral teeth.
Generates small or large radii on **both** corners of each tooth.
(Other workheads available)

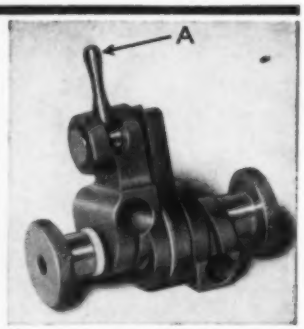


▲ THESE DEPENDABLE GRINDING FIXTURES SAVE THE LIFE OF YOUR CUTTERS. Write for our catalog 603

Radial Grinding Attachment D combines with Unit 1A for sharpening end mills with square, conical, or ball nose shapes. ▼

◀ UNIT 1A
This Universal Cutter Grinding Fixture fits any universal tool or surface grinder.

▲ UNIT 4A
Radial Grinding Fixture for sharpening fluted end mills with square, conical, or ball-nose mills. The index disc provides for multi-flute cutters.



▲ NEW FINE-ADJUSTMENT SLIDING SWIVEL GIVES SMOOTH, PRECISE INDICATOR SETTING. Smooth, positive positioning of finest dial indicator is readily accomplished by the fine-adjustment Sliding Swivel. Final precise positioning is accurately made by slight movement of convenient lever "A".
WRITE FOR:
SLIDING SWIVEL FOLDER

ROCHELEAU TOOL & DIE CO.
650 North Main St., Leominster 1, Mass.

Use postpaid card. Circle No. 249

White-Lined Tumbling Barrels Speed Small Parts Output

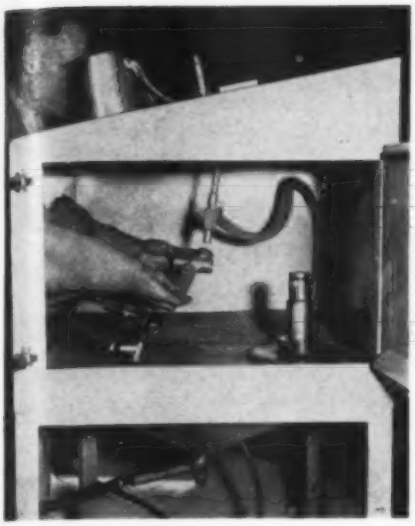
Jewelry and other small-size precision parts can be production-tumbled, using the new White-Lined Mini-Tumbler Barrels. They are lined with no-seam vinyl plastic, are non-contaminating and highly resistant to chemicals and abrasion. The white interior with greater light reflection, makes cleanliness readily visible and easier to maintain.

For bench use, the barrels are available in either open conical or closed barrel types, both suitable for steel ball burnishing. Closed barrel (illustrated) measures 9" diameter x 3¾" deep.

Rampe Manufacturing Co., 14915 Woodworth Ave., Cleveland 10, O. •

Use postpaid card. Circle No. 122

Rampe barrel for small-part tumbling.



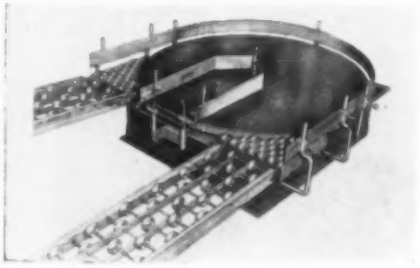
Sandblast Cabinet

A sandblast cabinet that may be used either with an adjustable mounted blast unit or with a trigger-controlled hand blast gun, has been announced by Cyclone Sandblast Equipment, San Francisco.

This permits fast production runs that lend themselves to sandblasting by mounted blast units, yet the hand gun can be used by the same operator when he has angles and crevices which are awkward to do with a fixed unit. The blast action of the mounted unit is controlled by a stop-and-start foot valve.

Cyclone Sandblast Equipment, 42 Clara St., San Francisco, Calif. •

Use postpaid card. Circle No. 123



Powered Turntable

A new powered turntable for use with powered or gravity conveyors has been announced by Samuel Olson Mfg. Company. Available with adjustable legs to bring the top to any practical height, the Olson turntable is designed to transfer packages or loads at either a 90 or 180 degree turn.

The 48″ diameter disc is direct-driven by a gearmotor at 25 RPM to produce approximately 300 FPM rotation. The Olson turntable requires only 5 ft. x 5 ft. (approximately) of floor space. A wide variety of auxiliary conveyor equipment is available from the manufacturer. A complete catalog is available on request.

Samuel Olson Mfg. Co., Inc., 2418 Bloomingdale Ave., Chicago, Ill. •

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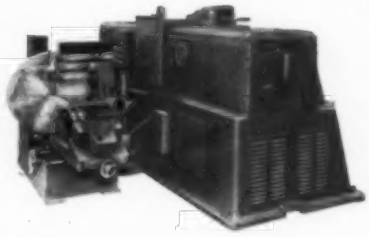
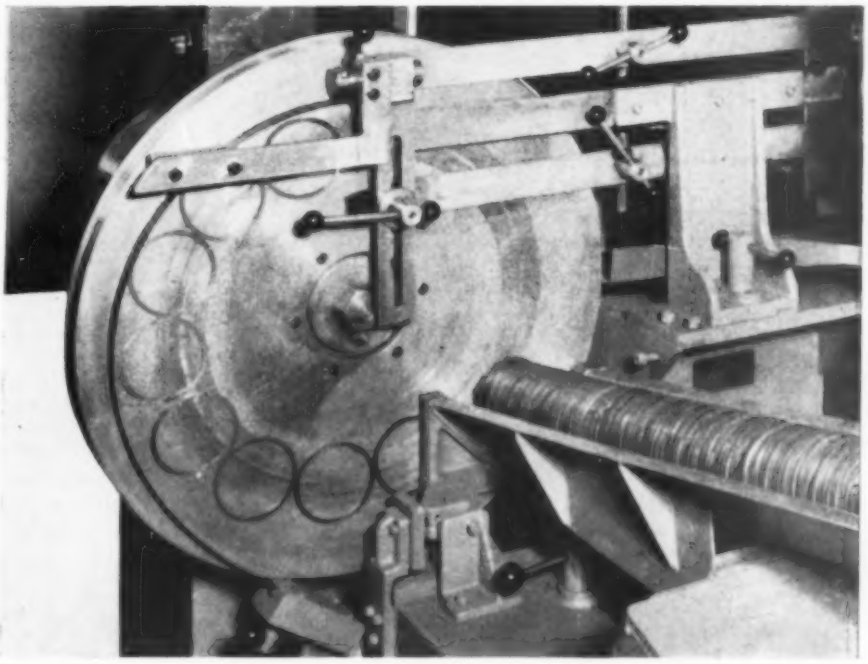
MAGNA-LOCK magnetic

ROTARY FEEDER



helps this disc grinder turn out six piston rings at each tick of the clock...

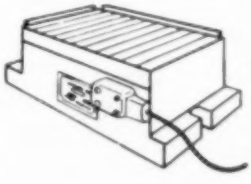


supplies continuous flow of pieces to the abrasive discs, permits full utilization of grinder's capacity

The Besly No. 240 Double Horizontal Spindle Grinder was developed to meet today's demands for ever increasing accuracy and speed. It's only natural that this machine incorporates automatic feeding—and only natural that a Magna-Lock electro-magnetic Rotary Feeder was selected.

Magna-Lock magnetic chucks and holding devices have solved many apparently unsolvable problems of holding, transferring and feeding. Perhaps Magna-Lock can solve *your* problem, too. Our engineers will be glad to work closely with you. Just write Dept. GF-57.

Request Magna-Lock as original equipment on your new machines.



Hanchett **MAGNA-LOCK CORPORATION**

BIG RAPIDS, MICHIGAN, U.S.A.

designers and makers of a complete line of magnetic chucks and devices.

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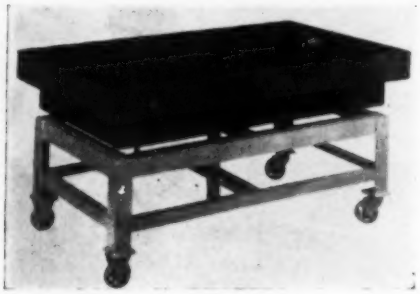
continued

Surface Plates

Expansion of the Machine Products Corp. line of cast iron surface plates and precision tool room checking



Black granite surface plate.

equipment to include Diabase ("black granite") surface plates, angles, and parallels, has been announced.

The diabase or "black granite" used in the surface plates was found, in National Bureau of Standards tests on 116 granite samples, to possess greater strength and density, lower absorption and porosity, and finer texture than the normal granites. In compressive strength it tested at 53,800 lbs. psi., the highest of all samples tested. Black granite also has a lower coefficient of thermal expansion, slower response to temperature change, and mineral composition more favorable for best surface configuration than pink or light grey granites.

In addition, granite plates offer the following features: freedom from rust or any other chemical alteration, lower response to temperature fluctuations, lower coefficient of thermal expansion, more resistant to wear, easier on tools.

Machine Products Corp., 6771 E. McNichols Rd., Detroit 12, Mich. •

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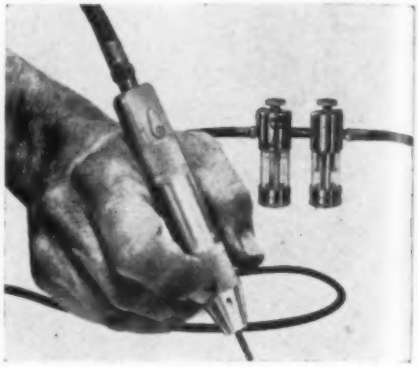
Air Grinder

A high speed air-powered grinder, designated Model GA-125, has been added to the Bellows line of "Controlled-Air-Power" Work Devices. Operating at 100,000 rpm at 80 lb psi, it does difficult jobs in many skilled and productive operations.



Bellows high speed air tool.

Jet-type turbine rotor floats on a cushion of air. Operating at high speed, all bearing load is carried by the air stream, virtually eliminating tool wear. The Model GA-125 grinder comes equipped with a Bellows Model FL-125 "Lubri-Air" filter-lubricator and 6' of nylon reinforced hose.

The Bellows Company, Akron 9, O., Attention D. Hardy. •

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APEX
DISC GRINDER

BRINGS YOU NEW HIGH SPEED HEAVY PRODUCTION AT LOW INITIAL COST

A popular disc grinder that incorporates features wanted most by industry. Table moves up and down, tilts accurately and squares automatically. Wrap-over guard tilts back to handle work at top of disc. Available in three disc sizes, 15", 16", 20" Specifically engineered to handle heavy production schedules at high speed with extreme accuracy. Economically priced. Write today for complete information and name of distributor nearest you.

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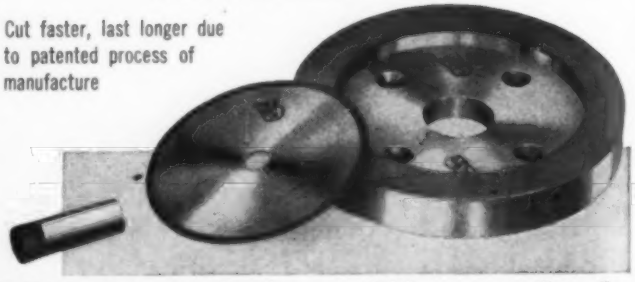

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Honing, Lapping	Ferrite
Slicing, Dicing	Germanium, Silicon
Drilling	Glass, Quartz
Reaming	Marble, Granite
Generating	Ceramics, Porcelain
Pencil edging	Sapphire
Chamfering, Beveling	Boron carbide
Grooving	Cermets

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Grinding and Finishing

News of Industry

Carborundum Officers for '57

Election of officers for the coming year, executive appointments and organization changes made by The Carborundum Company's board of directors at their monthly meeting March 21, following the annual stockholders meeting, have been announced by General Clinton F. Robinson, president of the company.

Officers re-elected for the ensuing year were: **Clinton F. Robinson,** president; **E. A. Montgomery,** secretary and general counsel; **Oliver A. Gottschalk,** treasurer-controller; **Anthony J. D'Arcangelo,** assistant treasurer; **Gilbert J. Stewart,** assistant treasurer; and the following vice presidents: Niles C. Bartholomew, Theodore H. Booth, Gene DeMambro, I. Wendell Hamm, Joseph S. Imirie, Boyd M. Johnson, Leslie E. Simon, William J. Ulrich, and William H. Wendel.

Frank J. Tone, Jr., with the company for over 30 years, retired from the position, senior vice president; however he continues active participation on the board of directors.

Vice president **Semon H. Stupakoff,** formerly general manager of the Stupakoff Division of the company and president of that firm before it became a division of Carborundum, resigned.

Leon A. Patt, formerly vice president and general manager of Canadian Carborundum Company Ltd. in Niagara Falls, Ontario, was elected Vice President of the parent company and appointed General Manager of the Bonded Abrasives Division. Patt succeeds **Theodore H. Booth.**

Vice President **I. Wendell Hamm,** formerly director of the manufacturing division of the functional staff, was transferred to the Bonded Abrasives Division.

Arden M. MacDonald, formerly manager of manufacturing of Canadian Carborundum, was promoted to general manager of that company.

George J. Zimmerman, formerly assistant to the president, was appointed director of the newly established Engineering Division. •

Sheffield Metrology Lab Announces Contract Service to Check, Calibrate Gage Blocks

To provide industry with an efficient method for checking and calibrating gage blocks, the new Eli Whitney Metrology laboratory of the Sheffield Corporation is making available a comprehensive contract service.

The new service, for checking and calibrating a complete variety of gage blocks, will be performed by the company's staff of metrology specialists. The laboratory is equipped to calibrate all types of gage blocks to light-wave standards of precision.

Growing precision requirements in industry have placed a severe burden on U.S. Government laboratory facilities and resulted in long and often costly delays, it was explained. The new contract service offered by Sheffield is designed to ease the burden on government facilities and to give industry faster service, it was stated. •

Ford's experimental Typhoon tractor uses a radically different type of engine of the free piston turbine variety. Here it's pulling a tow dynamometer for power measurement. Engine has only one cylinder, containing two pistons. This generates gases to drive turbine. Advantages: fewer moving parts, no spark ignition, ability to run on cheap low-volatility fuels.

continued

Jamaican Industry Progress

The manufacture of spun and pressed aluminum holloware has been approved under the Industrial Incentives Law of Jamaica, it has been announced by Harold A. Braham, general manager of the Industrial Development Corporation.

The approval is the first step in establishing a new industry here by a manufacturer, who after obtaining approval of the product may apply for approval of the company as one which can take advantage of Jamaica's liberal tax and duty allowances.

Manufacturers of spun and pressed aluminum holloware establishing plants in Jamaica now need only obtain Government approval of the individual company to receive the benefits, Mr. Braham said, since approval of the product itself has been granted.

"The number of companies which already have sought product approval under the new laws indicates an increased interest by United States manufacturers in expanding or relocating in Jamaica," Mr. Braham said. "They have come to realize that these new laws have made Jamaica one of the most profitable areas in the world for establishing manufacturing facilities."

•

Company Briefs

For the second time in two years, the **Grinding Machine Division of Norton Company** has won two top industrial safety awards. At ceremonies held March 19th James M. Lawson, general foreman and chairman of the division's plant safety committee, accepted the Massachusetts Safety Council's award for the best safety record in the heavy machinery group.

Arrow Tool and Reamer Company, manufacturers of end mills, special high speed steel and carbide cutting tools, has moved into a new building at 711 Stephenson Highway, Troy, Michigan.

J. L. Axelson Company has been named sales and engineering representative in southern California, for the Colonial Broach and Machine Company.

American Coldset Corp., manufacturers of precision diamond tools, grinding wheels, and coring bits will open their new plant and offices in Teterboro, N.J. in April, 1957.

Delivery of the thousandth Micro-Poise balancing machine was recently celebrated by the employees and their wives at a party in Detroit honoring **Joseph P. Lannen.** Lannen, founder of the Micro-Poise Engineering & Sales Company, began developing machinery for production balancing more than 30 years ago.

Jet engine bearings to operate at elevated temperatures are now made of a "99% native" alloy steel by the **Bower Roller Bearing Division** of Federal-Mogul-Bower Bearings, Inc., of Detroit. Development of the new alloy steel known as Bower "315" practically assures the supply of jet engine bearings in time of national emergency. The

Here is an interesting, straight-forward discussion of diamond abrasives used for polishing and finishing operations. The facts and figures presented are important to anyone producing fine finishes on hard materials . . . in mold polishing, production line finishing or die polishing.

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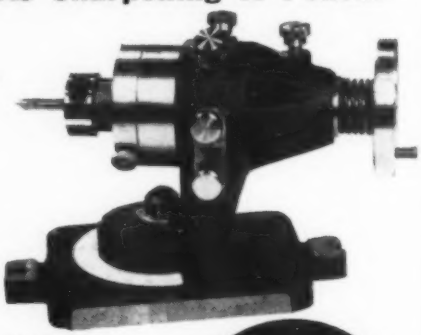
Has All the Money-Saving Features of Higher-Priced Machines!

Grinds and Relieves Chamfers of any Tap, Right or Left, up to ⅝".



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material requires no imported elements such as tungsten or cobalt.

Twenty-nine U. S. companies have opened metal fabricating plants in the **Commonwealth of Puerto Rico** during the last ten years. An appraisal reports total annual production over $5,000,000. Production includes tin cans, sprinkler irrigation parts, aluminum windows, doors, and screens, copper wire, and tools and dies. Services available locally vary from vacuum plating, metal stamping, sand casting, to zinc, chrome, copper and cadmium plating. Average net profit was 14 per cent, compared to four per cent in the continental U.S. after taxes.

The expansion of the Nuclear Division of **Stanat Manufacturing Company, Inc.,** Westbury, Long Island, N.Y. is scheduled for completion early in spring.

An applied mechanics engineering group headed by **H. J. Siekmann** as newly-appointed manager, has been formed at General Electric's Metallurgical Products Department, Detroit. The new unit, as part of the engineering section, will be responsible for obtaining basic information on physical properties, machinability, fundamental application requirements.

New England Metallurgical Corp. will take over the plant formerly owned by the **American Brake Shoe Co.** in Norwood, Mass., and operate it as a division.

Universal Vise and Tool Company has acquired manufacturing and sales rights to the integrated machine tool clamping and set-up system formerly produced by **Techno Products Inc.** of Cleveland.

Euclid Division of GM broke ground for a new 650,000 square foot plant in Hudson, Ohio, on March 27th. Plant will manufacture crawler tractors for heavy construction and industrial use.

The merger of **The Motch and Merryweather Machinery Co.** and **The Avey Drilling Machine Co.** has been announced. The Avey company will now be known as the Avey Division of Motch and Merryweather.

Spicer-Lindsay Associates, Denver, will act as agents for the abrasives division of Elgin National Watch Co.

Black & Decker Mfg. Co. has purchased a Canadian plant of 58,000 sq. ft. in Brockville, Ontario.

Air Transport Equipment, Inc., Amityville, N.Y., has been appointed exclusive U.S. agent for Wright table surface grinders.

General Motors Technical Center is employing radioactive isotopes to study certain phases of both production tool and automotive engine wear. The Center has found the use of short half-life 24-hour tungsten 187 ideal for cutting tool research.

Turchan Follower Machine Co., formerly of Detroit, has moved to its new plant at 26950 Van Born Rd., Inkster, Michigan.

288 members of the **National Tool & Die Manufacturers Association** have been presented safety awards for records compiled in 1956.

Electro Refractories and Abrasives Corp. has earmarked $157,000 for expansion of its Buffalo and Canadian plants.

American Smelting and Refining Company is expanding its central nonferrous metal research laboratories at South Plainfield, New Jersey, by one-third.

Consolidated net sales of the **Walworth Company,** leading manufacturers of valves and pipe fittings, were $84,308,978 for 1956, highest in the company's history, according to the annual report issued by Fred W. Belz, president. In 1955 Walworth net sales totaled $51,609,026.

Abrasive Cutting *the best way to cut many materials the only way to cut some*

Campbell Cut-Off Machines

WHAT KIND OF A CUT DOES YOUR JOB REQUIRE?

THIS Clean, smooth edges that require no further finishing

or THIS Rough, serrated edges that must be machined if smooth finish is required

• The smooth cross section of gear teeth, shown above, is cut smooth, fine-finished and ready for metallurgical study. Made on a CAMPBELL Wet Abrasive Cut-Off Machine —and the ALLISON Abrasive Wheel just right for the job—it saves a grinding operation at a Midwest gear plant.

Another CAMPBELL Cut-Off Machine cuts stainless steel tube twice as fast as other methods for a large aircraft manufacturer. Another cuts tough K Monel, 3¾" dia., in two minutes per cut.

These are but a few examples of the wide variety of materials and sizes which can be cut better—and *faster*—with CAMPBELL Cut-Off Machines. Let our abrasive cutting specialists check your cutting operation. It can save time and money.

There is a CAMPBELL machine to handle all sizes

Model 2 • hand-operated submerged cutting machine with 4" dia. capacity.
Model 15 • hand-operated wet or dry machine. Max. capacity 1" dia. solid, 2" tubing.
Model 223 • hand-operated bar cutting machine. Cap. 2" dia. solid, 4" tubing.
Model 265 • hydraulically-operated with capacity to cut 2" dia. solid, 4" tubing.
Model 302 • horizontal wet abrasive cutting machine for flat or irregular shapes.
Model 406 • high speed machine with capacity to cut 6" dia. solids in seconds.
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Model 509 • rotary oscillating hydraulic wet abrasive machine. Cuts material to 9" dia.

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News of Industry

continued

Hercules Flooring Company of New York announces opening of Pittsburgh and Detroit offices. **Thomas F. Witt** at Pittsburgh brings a wide knowledge of special floors for Steel Plants. **Fred G. Hyne** at Detroit carries fourteen years of solving automotive plant floor problems.

Tube Reducing Corporation, Wallington, New Jersey, manufacturer of seamless tubing, has announced the appointment of Industrial Products Sales, Inc., Akron, Ohio, as sales agency for their rockdrawn tubing line.

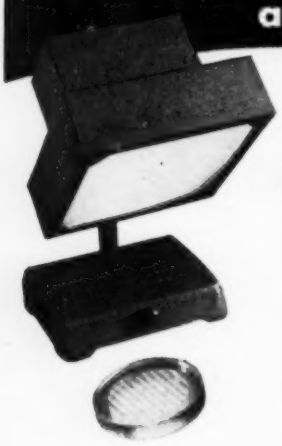
Ex-Cell-O Corporation reports consolidated net earnings of $14,148,707 for the year ending November 30, 1956. Consolidated net sales and gross income from leased machines totaled $150,256,422. This compares with consolidated net sales and gross income from leased machines in 1955 of $92,475,014 and net earnings of $9,541,577.

Stauffer Chemical Company announces plans to expand its Niagara Falls facilities for the manufacture of zirconium tetrachloride and silicon tetrachloride. The need for zirconium metal, used extensively in nuclear reactors, has contributed substantially to requirements for zirconium tetrachloride, the raw material from which the metal is made.

Solar Aircraft Company has become the U.S. Navy's first equipment supplier to receive a contract in a new Bureau of Ships "value engineering" program.

Under the program a creative study is made of every cost item in the product or service under investigation. Solar will carry out a value analysis of the company's 50 hp Mars gas turbine engine. A special value engineering group has been established by Solar to undertake the study.

QUALITY CONTROL at your machine



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Do all these operations better, faster, at lower cost with

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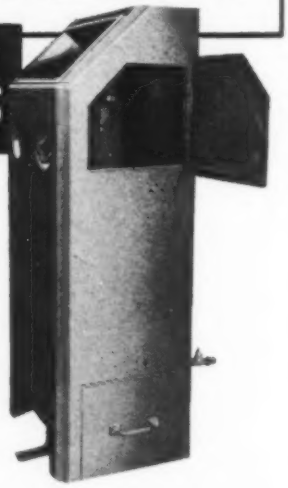
Cabinet Type LEIMAN SANDBLASTS



Whether you work on metal, glass, plastics, compositions... whether on production runs or single pieces, large or small—you'll find countless uses for versatile Leiman Sandblasts. Easily operated by unskilled help. Require little floor space. Use all types of abrasives. Well-designed, rugged, priced right, last for years.

Send for informative bulletin "Sandblasting", plus catalog showing complete line.

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Personnel Briefs

Ernest **Mortensen,** a leading figure in the building of Michigan's cutting tool industry and until his recent retirement president and general manager of Wesson Tool Company, died suddenly at his summer home March 22nd.

Three promotions in the machinery sales department of Pratt & Whitney Company Inc. have been announced. **Paul C. Renno,** former sales representative in Chicago, has been named district sales manager in Hartford. **Wallace Tefft Jr.** has been transferred to Chicago to fill Renno's post. **J. James Tasillo** has been promoted from sales engineer to sales representative in Hartford.

Richard L. Horn has been appointed field test engineer for the Michigan area by the grinding wheel division of Electro Refractories and Abrasives Corp.

Henry J. Harden has been appointed an abrasive engineer with the Peninsular Grinding Wheel Division, Detroit.

H. B. Bradshaw, named to De Laval Chicago post.

John J. Fajnor, vp of Brad Foote Gear Works.

H. B. Bradshaw has been appointed general manager of The De Laval Separator Company's midwestern office in Chicago.

John J. Fajnor has been elected a vice president of Brad Foote Gear Works, Inc., Chicago.

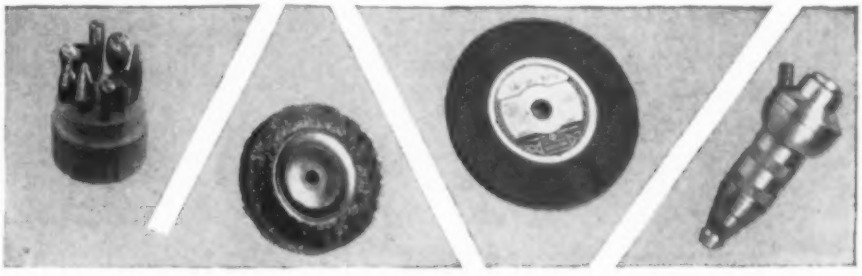
Albert M. Dexter, former Pratt & Whitney manager of gage research, has been named assistant to the manager of the company's Gage Division. **Arthur H. Wolfson** succeeds Dexter as manager of gage research.

James L. Tolley has been named director of the General Motors Corporation Previews of Progress, mobile units which demonstrate industrial and engineering progress before the nation's high school students.

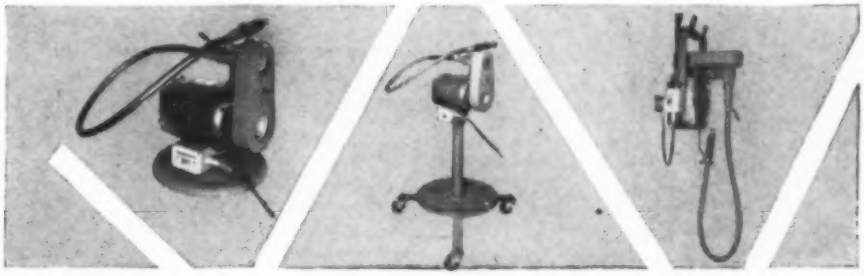
Henry J. Fredericks has been named controller-treasurer of the Pratt & Whitney Company, Inc. He succeeds **Louis Reiss,** who is leaving the company to become treasurer of the Motch and Merryweather Machinery Company, Cleveland.

William B. Summers, Carborundum coated abrasives field sales manager on the Pacific Coast, has been transferred in the same capacity to the Cleveland-Pittsburgh districts. Summers succeeds **F. M. Mansbury.**

Seven Armour and Company Coated Abrasives sales employees were awarded trophies for their 1956 performances. They are, left to right: Dick Heiniger, Emerson Wilhelm (front), Andrew March (rear), Tom Duddy, Michael Carr, Andrew Cochran, Mearll Shetler and Stanley Melliss.



everything you need



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Whether you're grinding, wire-brushing, filing, whatever the job, a start with Haskins will carry you through from the beginning right down to a perfect finish. Our three models, bench, pedestal and suspended mounts, plus a multiplicity of metal-working tools, enable you to achieve faster production, lower labor costs and a superior finished part! Find out about the versatile line of Haskins flexible shaft machines and accessories—*leaders in their field for over 30 years.*

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continued

John C. Wallace has been named vice-president of engineering for the Walworth Company, manufacturer of valves and fittings.

Harold R. Irish has been appointed manager of the order department for General Abrasive Co., Inc. Irish succeeds **Felix B. Hall,** who passed away suddenly on March 8th.

John E. Montgomery, formerly chief tool engineer at Solar Aircraft's Des Moines plant, has been named general manager of Sheaffer's Tool & Die plant, Fort Madison, Iowa, a division of the W. A. Sheaffer Pen Company.

Barron J. Gue and **David M. Thorsen** have joined The Lincoln Electric Company's district offices at Pittsburgh, Pennsylvania, and Union, New Jersey, respectively.

Joseph F. Joy, 73, founder of the Joy Manufacturing Company, and a pioneer in mechanized mining equipment, died at his home in Ft. Pierce, Fla., on Tuesday, February 19. He had suffered a heart ailment for several years.

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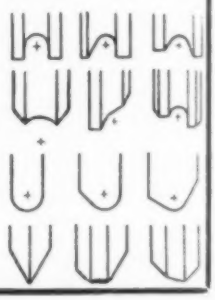

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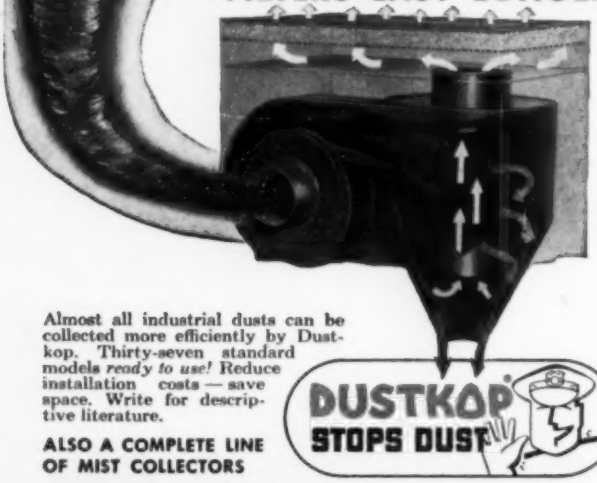

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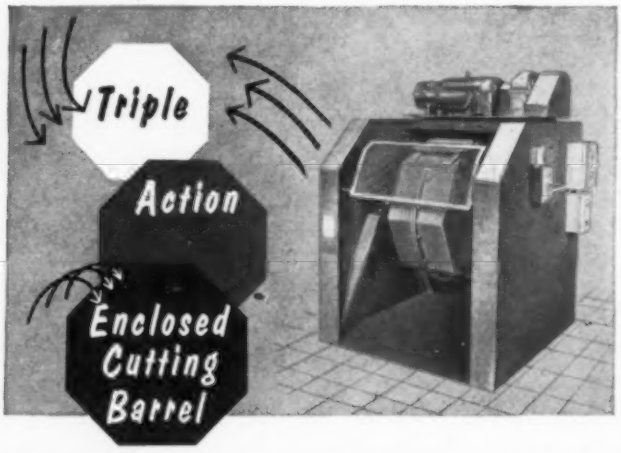

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Left, Myles A. Snyder, Norton abrasive engineer assigned to Chicago office. Right, John E. Taylor, Norton abrasive engineer in western Iowa.

Myles A. Snyder, formerly Norton abrasive engineer in western Iowa, has been reassigned to the Norton Chicago office. At the same time, **John E. Taylor,** formerly field engineer at Norton's Cleveland office, has been appointed an abrasive engineer and assigned to the territory formerly covered by Snyder.

Lewis S. List has been promoted to the post of manager of the Air Appliance Department, Industrial Divisions, U. S. Hoffman Machinery Corp.

Henry R. Merrill, since 1955 general sales manager of Behr-Manning Co., has been appointed vice-president in charge of sales.

Harvey J. Robillard has been appointed manager of sales engineering for The Exolon Company. The company also announced appointment of **Daniel F. O'Connor** as sales manager.

Daniel F. O'Connor, sales manager, Exolon Co.

Harvey J. Robillard, Exolon sales engineering manager.

Lewis S. List, U. S. Hoffman air appliance department.

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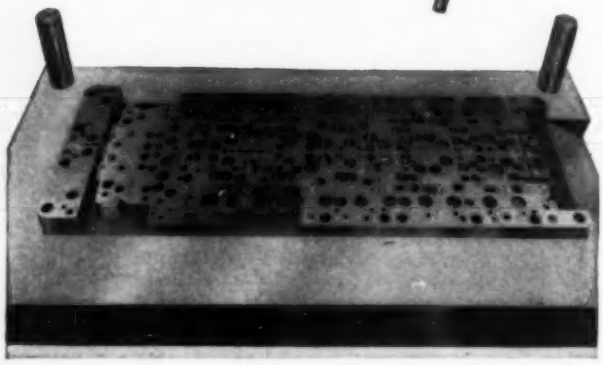

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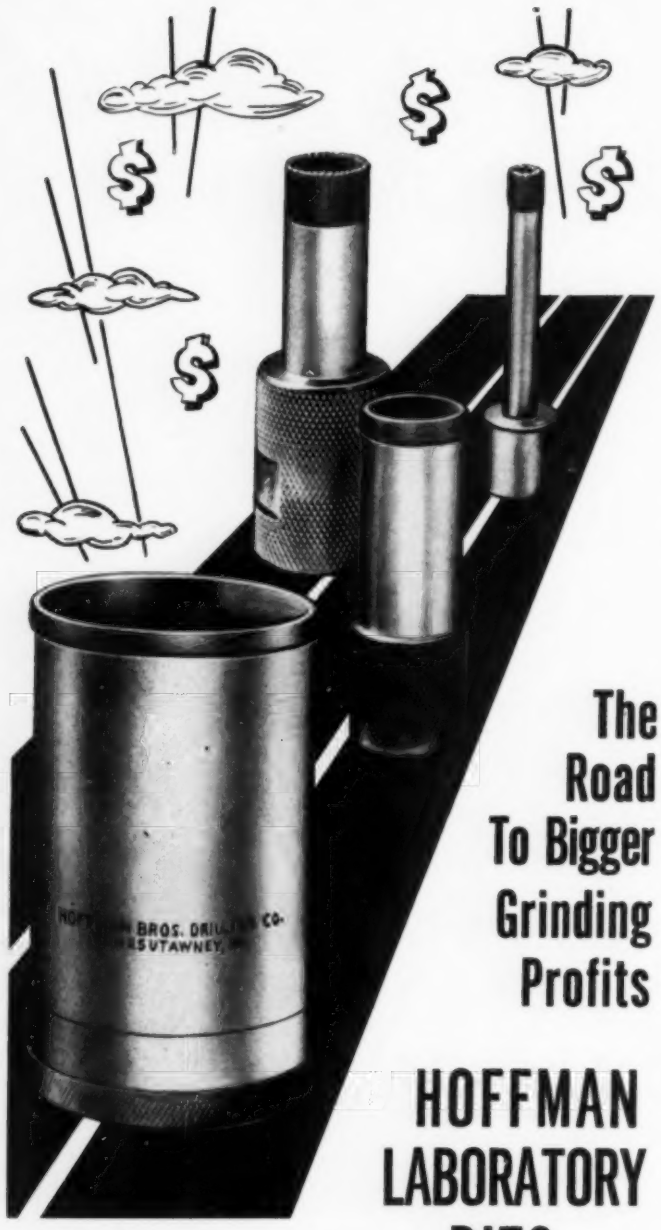

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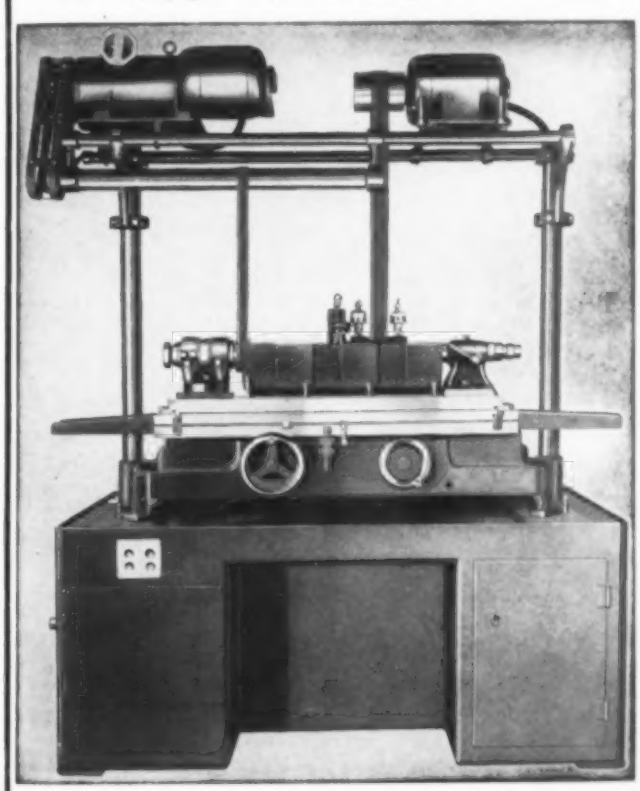

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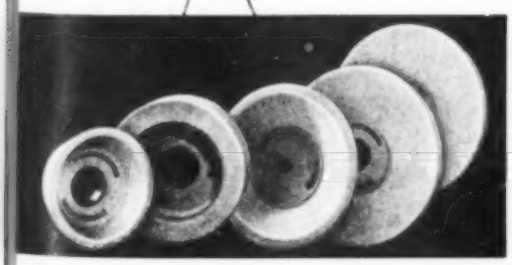
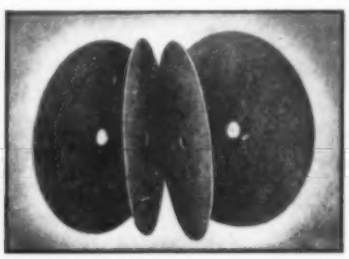
Today, the automated, high speed grinding of new and improved metals calls for higher quality grinding wheels than ever before. Wheels like the Macklin V-8 illustrated above. V-8 is setting new standards of performance in the grinding of cemented carbide tools. It cuts faster with less push, and it's easy on the tools. *Your* management will like V-8's long wheel life, and the way it cuts down operator fatigue.

But, *V-8 is only one of a complete line of* Macklin "Wheels of Profit" for industry. Every Macklin wheel is designed to meet the demands of today's production, is part of a program of constant product development and improvement . . . because planning for tomorrow's production today is our most important job.

YOUR NEAREST MACKLIN DISTRIBUTOR OR FIELD ENGINEER WILL BE GLAD TO DEMONSTRATE THE MACKLIN WHEEL WHICH IS BEST FOR YOUR PARTICULAR GRINDING PROBLEM. YOUR LETTER OR PHONE CALL WILL RECEIVE PROMPT ACTION.

MACKLIN company Dept. 63, Jackson, Michigan





Wheels for . . .

- Surface Grinding
- Cylindrical Grinding
- Centerless Grinding
- Tool Sharpening
- Wirebound Cylinder Wheels
- Foundry Wheels
- Segmental Wheels
- Cut-Off Wheels

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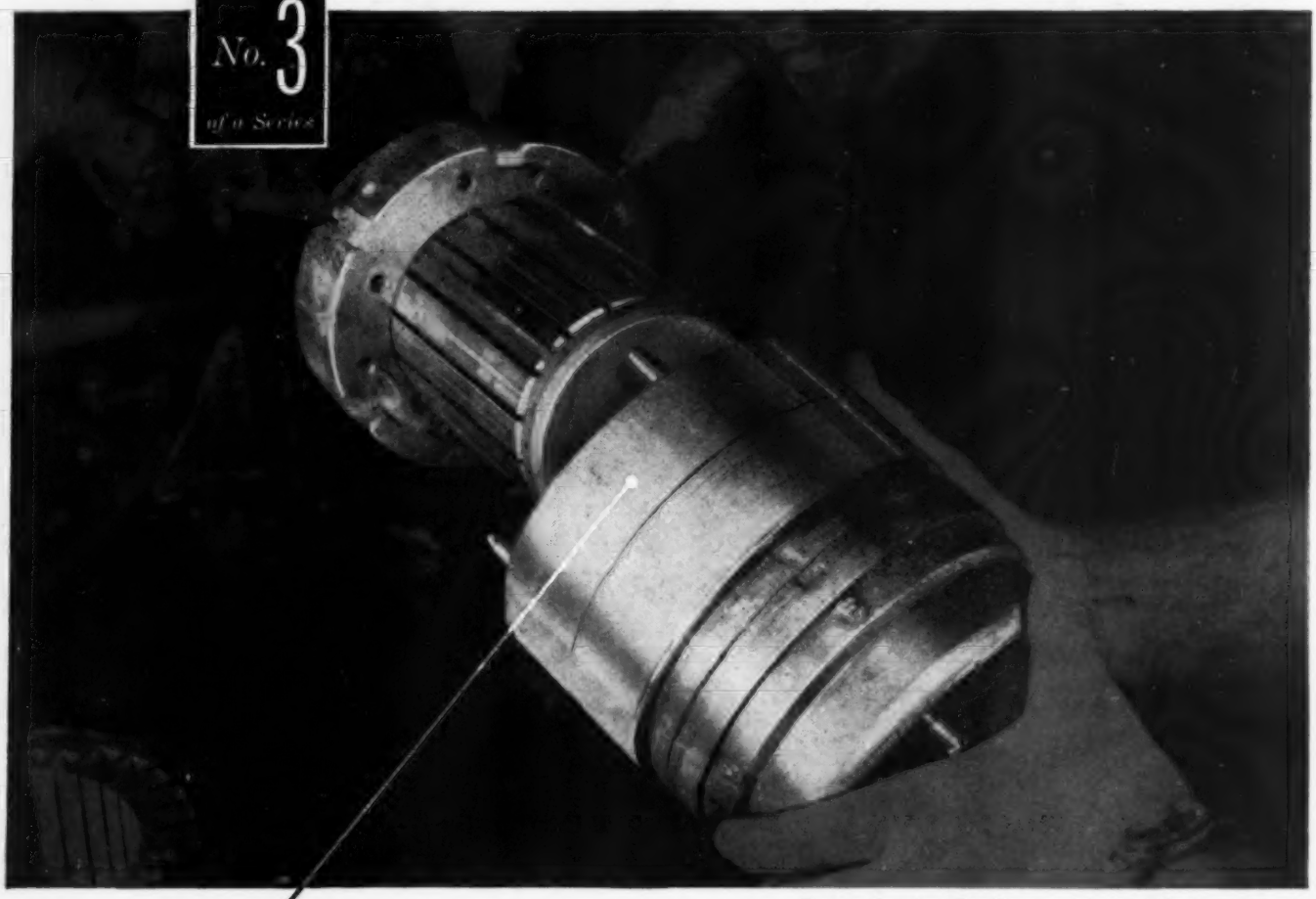
Erickson Precision Expanding Mandrels Solve Assembly Problems

No. 3 of a Series



Photos: Courtesy The Emerson Electric Mfg. Co., St. Louis

e.g. electric motor stators

Emerson Electric, big-name electrical manufacturer, assembles stator laminations the modern way—with Erickson Mandrels. Gone are the old-fashioned arbor assembly methods that require a large tolerance between laminations and arbor . . . that lead to eccentricity of stator bore and to additional finishing operations on the OD.

Emerson Electric works "from the inside out" with Erickson Precision Expanding Mandrels. Laminations are placed on a fixture and the fixture slipped over the expanding mandrel. Laminations are then welded together with two passes through a three-torch head.

Result? Stators are concentric within Erickson's guaranteed accuracy of five "tenths." And Emerson Electric gets a better motor with uniform air gap . . . that produces uniform torque and rated horsepower . . . that creates minimum electrical interference . . . and that lasts longer.

If this cost-cutting case history triggers your imagination, contact the nearest Erickson representative. He'll be pleased to demonstrate how Erickson Precision Expanding Mandrels can cut your assembly costs.

AA-4133

Collet Chucks
Floating Holders
Tap Chucks
Indexers

ERICKSON TOOL COMPANY

2300 Hamilton Avenue • Cleveland 14, Ohio

Tap Holders
Air-Operated Chucks
Expanding Collets
Special Holding Fixtures

ID of stator assembly (lower left) requires no finishing operation after welding.

Bothered by a tough holding problem? Then let us show you how Erickson mandrels speed production, lower grinding or inspection costs. Write for Catalog K.

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